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ANALYSIS OF FUEL TANKER VESSELS AVAILABLE IN A DUAL MULTI-THEATER WAR (MTW)

by

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March 2000

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This thesis develops a database and makes projections of fuel tanker vessels available between now and 2010 that can support U.S. forces in wartime. The United States Transportation Command and Military Sealift Command must ensure there are sufficient fuel tanker vessels to transport fuel to the forces in a dual multi-theater war (MTW). Once the available assets are known, then DOD can determine the adequacy of the number of vessels based on the fuel requirements. These vessels are of two categories: DOD organic assets and commercial fuel tanker assets.

What this thesis shows is that DOD assets will remain virtually the same for the next ten years but the number of U.S.-flag tanker vessels will decline dramatically. In a dual MTW scenario there will not be enough DOD or U.S.-flag tanker vessels available to meet demand. DOD must consider an alternative policy of outsourcing to foreign flag vessels for the delivery of fuel products to U.S. Armed Forces during war.

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ANALYSIS OF FUEL TANKER ASSETS AVAILABLE IN A DUAL MULTI-THEATER WAR (MTW)

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This thesis develops a database and makes projections of fuel tanker vessels available between now and 2010 that can support U.S. forces in wartime. The United States Transportation Command and Military Sealift Command must ensure there are sufficient fuel tanker vessels to transport fuel to the forces in a dual multi-theater war (MTW). Once the available assets are known, then DOD can determine the adequacy of the number of vessels based on the fuel requirements. These vessels are of two categories: DOD organic assets and commercial fuel tanker assets.

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ACRONYMS

AOE	Fast combat support ship
APF	Afloat Prepostioning Force
APS	Afloat Prepositioning Ship
BBL	Barrel, a measurement of liquid products (42 U.S. gallons)
CJCS	Chairman, Joint Chiefs of Staff
CNA	Center for Naval Analysis
CNO	Chief of Naval Operations
COCOM	Combatant Command (command authority)
CONUS	Continental United States
DESC	Defense Energy Support Center
DFM	Diesel Fuel Marine
DLA	Defense Logistics Agency
DOD	Department of Defense
DOT	Department of Transportation
DWT	Deadweight ton (in long tons of 2240 pounds)
EUSC	Effective United States Control
J4	Joint Staff's Director for Logistics
JP5	Kerosene based jet fuel used for U.S. Navy aircraft
JP8	Kerosene based jet fuel used for non-U.S. Navy aircraft
JCS	Joint Chiefs of Staff
JS	Joint Staff
LT	Long Ton (2240 pounds)
MARAD	U.S. Maritime Administration
MPF	Maritime Prepositioning Force
MRS	Mobility Requirements Study
MSC	Military Sealift Command

MT	Measurement Ton (40 cubic ft)
MTS	Military Transportation System
NATO	North Atlantic Treaty Organization
NAVPETOFF	Navy Petroleum Office
NCA	National Command Authority
NDRF	National Defense Reserve Force
NMS	National Military Strategy
OOTW	Operations Other Than War
OPDS	Offshore Petroleum Discharge System
OPLAN	Operations Plan
OSD	Office of Secretary of Defense
POL	Petroleum, Oil, and Lubrication
PREPO	Prepositioning
ROK	Republic of Korea
ROS	Reduced Operating Status
RRF	Ready Reserve Force
UNREP	Underway Replenishment
US	United States
USN	United States Navy
USNS	United States Naval Ship
USCINCTRANS	Commander in Chief, United States Transportation Command
USTC	United States Transportation Command
USTRANSCOM	United States Transportation Command
VISA	Voluntary Intermodal Sealift Agreement
VTA	Voluntary Tanker Agreement

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I. INTRODUCTION

The United States military faces many challenges in the next decade. Some of these challenges include but are not limited to budget constraints, readiness, retention, technological innovation, and political changes. In order to meet some of these challenges the Joint Chiefs of Staff (JCS) developed Joint Vision 2010 (JV 2010). JV 2010 develops four operational concepts: dominant maneuver, precision engagement, full dimensional protection, and focused logistics. In order to achieve dominant maneuver, precision engagement, and full dimensional protection, logistics must be responsive, flexible, and precise. To accomplish this type of logistics, the Service and Defense agencies will work jointly and integrate with the civilian sector to take advantage of advanced business practices, commercial economies, and global networks. No where is this more important than in the area of transportation. One key aspect of this is the movement of fuel to the battlefield. Without the fuel, the forces cannot fight. There must be enough fuel in a simultaneous dual multi-theater war (MTW). The most likely scenario would be the Persian Gulf and the Korean Peninsula. There must be enough assets to deliver the fuel and other petroleum, oil, and lubricants (POL) required in such a contingency. During wartime, POL requirements for surge (initial delivery and buildup) and sustainment (long-term continuing requirements) exceed the transport capability of fuel tankers owned by the Department of Defense (DOD). [Quintanilla] The importance of sealift is best described by the 1998 MARAD report to Congress:

> Sealift is essential to execute this country's forward defense strategy and to maintain a wartime economy. America's national sealift objective is to ensure that sufficient military and civil maritime resources will be available to meet defense deployment and essential civilian economy requirements in support of our national security strategy. During national emergencies, there must be adequate sealift available on a timely basis to support deployment and sustainment of U.S. military forces. [MARAD, p.3]

A. PURPOSE

This research will develop and analyze a database of current and future fuel tanker assets available for Department of Defense (DOD) in a dual (MTW) scenario. The projection of assets will be from January 2000 until the year 2010. The analysis will divide the assets into two areas. The first area is government assets that are assigned to the U.S. Navy, Military Sealift Command, and the Maritime Administration that includes the National Defense Reserve Force and the Ready Reserve Force. The second area to be examined is assets in the commercial sector that includes United States flagged vessels, vessels under Effective United States Control (EUSC), and foreign flagged vessels. The objective is to perform a thorough analysis of these two areas in order to provide the agencies within DOD and other sectors of government the fuel tanker assets available in a dual MTW.

B. RESEARCH QUESTIONS

Primary Question: Will there be enough fuel tanker vessels available to the Department of Defense to transport petroleum products in a dual Multi-theater War?

Secondary Questions:

1. What are the current and future fuel tanker assets of the U.S. Navy, Military Sealift Command, and Maritime Administration?
2. What are the current and future fuel tanker assets of U.S. flagged vessels, vessels under Effective United States Control, and foreign flagged vessels?
3. Is the Voluntary Tanker Agreement a reliable and accurate source of fuel tanker assets?

   Can DOD depend on such information?
4. Are vessels under Effective United States Control available in a timely manner?
5. What are the implications of existing and emerging public law such as the Oil Pollution Act of 1990?
6. Will utilizing U.S. flagged vessels interfere with the normal day-to-day economic activities?
7. Can foreign vessels be depended on during a time of war?

C. THESIS OUTLINE

The thesis is divided into five chapters with the first one providing some introductory information. Chapter 2 gives the background of fuel tanker vessels and their use in DOD. Chapter 3 discusses current and future assets available to DOD in an emergency, i.e., military and commercial. Chapter 4 is an analysis of what the current and future problems are for DOD planners in acquisitioning and activating enough fuel tanker vessels to meet the requirements in a dual MTW. Chapter 5 concludes the thesis with recommendations for DOD and suggests further studies.

D. EXPECTED BENEFITS OF THIS THESIS

The expected benefits of this thesis are to provide a current database of current and future fuel tanker vessels available to DOD in a dual MTW. This thesis will analyze and determine the availability of tanker assets in order for military planners to execute Operations Plans (OPLANS) when necessary.

II. BACKGROUND

A. INTRODUCTION

The U.S. military has a tremendous dependence on distilled bulk petroleum fuel products. These petroleum, oil, and lubricant (POL) products include diesel fuel, F76/DFM (ship's propulsion fuel), and JP5/JP8 (aircraft fuel). Because of this dependency on fuel, DOD has established a significant number of fuel storage, distribution, and handling facilities around the world. DOD must be able to replenish these facilities and provide fuel to the battlefield. Since Desert Shield/Desert Storm the U.S. military has seen a significant increase in smaller contingency operations (Bosnia and Kosovo) and numerous humanitarian operations. The forces must have fuel to conduct these operations. The best and most reliable way to provide this fuel is through the use of sealift. The U.S. must be able to move bulk fuels across the seas to the battlefield. The best example of this was the conflict with Iraq. During this war 6.1 million tons of POL were delivered: 2.4 million tons in phase 1, 1.4 million tons in Phase 2, and 2.3 million tons in phase Desert Storm. [Holt] Fortunately for the U.S. and allied forces the facilities and infrastructure of neighboring countries was made available during the crisis. Also, the crude oil and refineries were within a reasonable distance to the battlefield. However, this may not always be a correct assumption. A good example of this is recent operations in Bosnia and Kosovo. Fuel had to be shipped via small foreign flagged tankers and barges because of the poor infrastructure and accessibility. No matter

the situation or location, fuel must get to the forces to allow them the logistical support to accomlish the mission.

Sealift capacity for DOD comes from ships operating in commercial trade, commercial ships under long-term charter to DOD, government-owned "surge" ships maintained by the Military Sealift Command (MSC) in a fast response deployment status and Ready Reserve Force (Surge) ships as maintained in reserve status by the Maritime Administration (MARAD). [DTJ, April 1999] This sealift capacity provides various types of cargo capacity, but this thesis is focused primarily with tanker capacity for fuels.

This chapter will discuss the levels of logistic support, concept of operations of the use of fuel tankers, an in-depth look at the Defense Transportation System (DTS), types of tankers used by DOD, and finally how DOD goes about acquisitioning and activating these vessels.

B. LEVELS OF LOGISTIC SUPPORT

In most military operations the level of logistic support can be divided into three levels: strategic logisitics, operational logisitcs, and tactical logistics. Specifically, these three levels consist of the following:

1. Strategic Logistics

This level encompasses the nation's ability to display and sustain its operating forces in executing the National Military Strategy (NMS). In terms of marine transportation this is called intertheater sealift. Basically it is the movement of supplies (fuel in this case) from the United States to the theater of operation. It may also come

from other areas of the world, but in order for it to be intertheater, by definition it must come from outside the area of operations.

2. Operational Logistics

This level of logistics involves coordinating and providing intratheater logistic resources to operating forces, and primarily concerns the Unified Combatant Commanders and the Service Component Commanders. Once the supplies have reached the theater of operations via the intertheater sealift they must then be distributed as allocated to the local forces.

3. Tactical Logistics

The tactical logistics level focuses on planning and support within and among operating units of the task force or battle group. [NDP 4]

These three levels hold true for the military services within DOD. To develop an understanding of how it works, the concept of operations for a Carrier Battle Group (CVBG)/Amphibious Ready Group (ARG) is discussed next.

C. CONCEPT OF OPERATIONS

The concept of operations for providing fuel to the naval forces occurs in three stages similar to the levels of logistic support discussed in the previous section. The first stage involves the use of merchant shipping to move the fuel into the theater of operation or to a forward base. This is done using organic ir contract tankers. The next stage occurs when a Navy or MSC vessel receives the fuel at the forward base and is ready to

deliver the fuel. The third stage is when the fuel is actually delivered to the CVBG or ARG. This three-stage fuel logistics support train is depicted in Figure 1. [Kaskin]

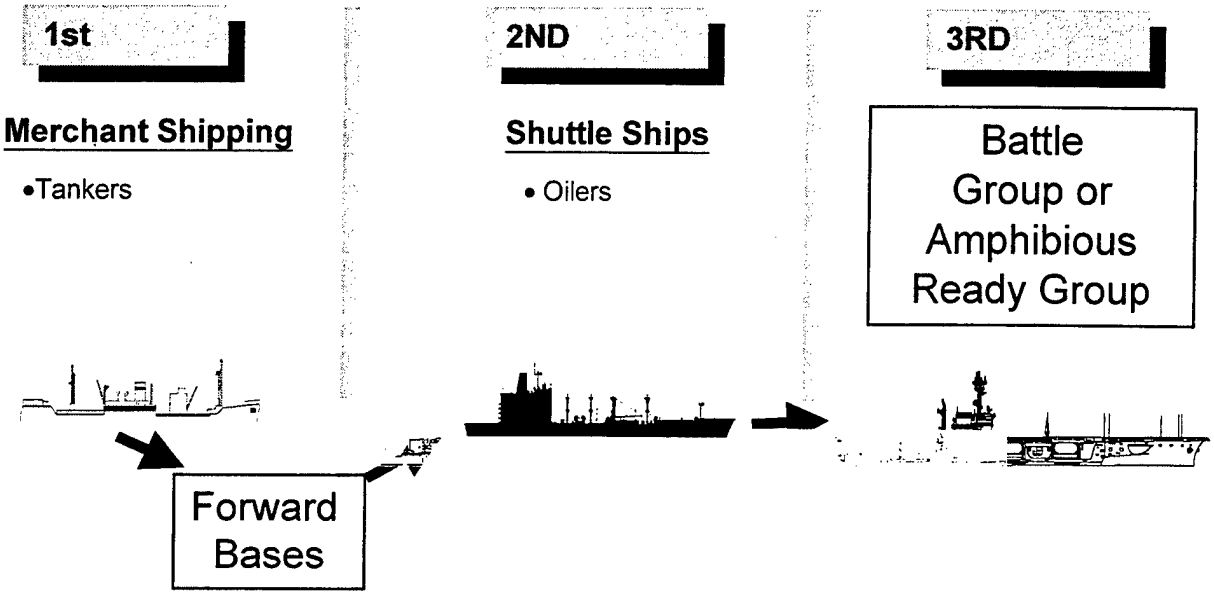

Figure 1. Three Stage Logistics Support Train

The focus of this thesis will be on the first stage. This is where commercial shipping will have to be utilized and it is where the U.S. military is most vulnerable in a dual MTW. During wartime, POL requirements can be divided into two categories: surge (initial delivery and buildup) and sustainment (long-term continuing requirements). In order to meet these POL requirements, DOD has developed a transportation system consisting of military and commercial resources to ensure the required amounts of fuel get to the right place, at the right time, and in the right amount. This will be discussed in the next section.

D. DEFENSE TRANSPORTATION SYSTEM

The Defense Transportation System (DTS) is that portion of the nation's transportation infrastructure that supports DOD common-user transportation needs across the range of military operations. [JP4-01] The DTS is depicted in Figure 2.

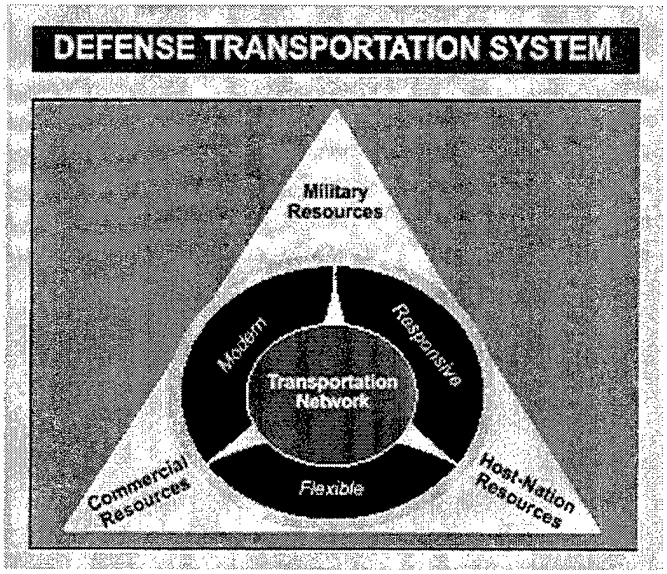

Figure 2. Defense Transportation System (DTS)

As can be seen by Figure 2, the DTS incorporates military, commercial, and host-nation resources if the transportation system is to be modern, responsive, and flexible. The most dependable of these resources is the military resources, followed by commercial, and then host nation. Host-nation resources will not be discussed in this thesis, as it is a complex separate issue. However, military planners must take into consideration host-nation resources as part of the OPLANS.

In order to coordinate the entire transportation process, the Commander in Chief, U.S. Transportation Command (USCINCTRANS) is assigned the mission to provide air, land, and sea transportation for DOD, both in times of peace and in times of war. [JP 4-01]

The components that comprise USTRANSCOM are provided in Figure 3.

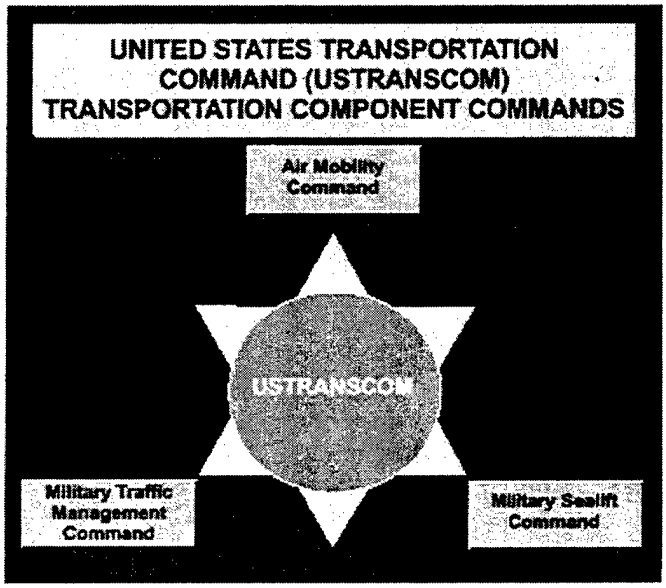

Figure 3. Components of USTRANSCOM

The duties of USTRANSCOM can be summarized in the following paragraph:

> Exercises combatant command (command authority) of the transportation assets of the military departments and is the DOD single manager for transportation. It aligns traffic management and transportation single manager responsibilities to achieve optimum responsiveness, effectiveness, and economy. USTRANSCOM establishes and maintains relationships between the DOD and the commercial transportation industry. Geographic commanders in chief (CINC's) who have transportation assets assigned to their command should ensure the assets are managed, controlled, and capable of full integration into the DTS. [JP4-01.2, p. II-5]

The key player for sealift is the MSC. As a component of USTRANSCOM, MSC provides strategic common-user sealift necessary in military operations. Under normal peacetime conditions, the MSC force consists of government-owned ships as well as privately-owned ships under long-term charter to the DOD. During periods of increased requirements, MSC can procure additional voluntary charters through the Air Force Working Capital Fund-Transportation or by selective activation of Ready Reserve Force (RRF) vessels. [JP 4-01] The Defense Energy Support Center (DESC) also plays a major role in this process. Their only concern is for the movement of petroleum products. The MSC charters the ships and retains operational control of them, responding to the scheduling requirements provided by DESC. Shipments by ocean tanker are managed centrally in the Bulk Fuels section of DESC. DESC also closely monitors the loading and unloading times of the tankers and initiates claims to collect demurrage from suppliers who cause delays [DESC]. The types of vessels that MSC may charter will be discussed next.

E. TYPES OF TANKERS

There are various types and sizes of fuel tanker vessels. Initially, a couple of definitions need to be clarified. First, sealift forces are those militarily useful merchant-type ships available to the DOD to execute sealift requirements of the National Military Strategy (NMS) across the range of military operations. [JP4-01.2] The key to this definition is "militarily useful". There are many U.S.-flag and foreign flag tanker vessels

that are operating at the present time. However, not that many are military useful because of their large size. To be military useful, a product tanker must be large enough (over 35,000 DWT) to carry the required amount of petroleum on one voyage, but at the same time be able to discharge at a designated port that is capable of this size of vessel. Terminal space, draft constraints, and product storage space may make some vessels too large for military usefulness. Therefore, a vessels size of 35,000 to 80,000 deadweight (DWT) is considered military useful. [Quintanilla] This size limitation will depend on the location of the conflict and the requirements of the DOD. This will be discussed more later, but Appendix J provides the current list of U.S.-flag tanker vessels that are militarily useful.

Another useful definition is "common-user" shipping which is ships engaged in the transportation of cargoes for two or more Services from one seaport to another or to a location at sea in the theater of operations pending a decision to move the cargo embarked ashore. [JP 4-01.2] There are five sources available to DOD to transport fuel via sealift. They are:

1. Government-owned/controlled shipping: these vessels are made up of U.S. Navy and MSC assets. See Appendix's F and G.
2. Government-owned reserved or inactive vessels: these vessels are of the RRF and NDRF. See Appendix H.
3. U.S.-Flag shipping: these vessels are owned and operated by U.S. companies. See Appendix's I and J.

4. U.S. owned, Foreign flag shipping: these vessels are owned by U.S. companies but sail (registered) under a foreign flag. See Appendix O.
5. Foreign flag: these vessels are foreign owned and flagged.

See Appendix N. [JP 4-01.2]

Tanker capacities can be classified by two ways: barrels (BBL) or by (DWT). One barrel equals 42 US gallons. DWT is measured in Long ton (LT) of 2,240 pounds.

Liquid cargo carriers, or tankers, can be classified by what cargo they carry and size of vessel. Normally, these vessels carry two types of petroleum products: crude oil and product oil. There is a big difference (and sometimes confusion) on what a vessel can and cannot carry. The difference explained:

> The crude oil carriers thought of as carrying "dirty" cargoes simply because the crude cargo is incompatible with other petroleum products that have already undergone some form of refining. To mix the products would contaminate the refined product with the crude oil. The same holds true for various types and grades of refined fuel products. Aviation grade fuels cannot be mixed with heavier diesel fuels and still be used for aircraft operations, though diesel fuel that has been mixed with aviation grade fuel may still be usable for vehicles and machinery. [Quintanilla]

A tanker carrying "dirty" (crude oil) cargo will require about two weeks of manual labor to clean its tank and piping before carrying "clean" (refined product) cargo. [JP 4-01.2] For DOD this can be a loss of precious time in a dual MTW, and is expensive to have these tanks cleaned.

The more that is discussed about fuel tankers, the more the limitations are placed on DOD to locate and utilize such vessels. The biggest limitation for DOD purposes is the size of these fuel tanker vessels. Fuel tanker vessels can be classified by three types:

1. Handy Size Tankers

The handy size tanker (6,000 to 35,000 cargo DWT or approximately 48,000 to 280,000 BBLs) are the most military useful. It can carry clean or refined products. The advantages are their ability to enter most of the world's tanker ports, short time to clean if necessary and flexibility with the types of cargo they can carry. Disadvantages include the small capacity and limited availability on the commercial market. These vessels are what the Navy and MSC currently has in its inventory

2. Medium Size Tankers

The medium size tanker (35,000 to 100,000 cargo DWT or approximately 280,000 to 800,000 BBLs). Most tankers under 60,000 DWT carry clean or refined product, while those above 80,000 DWT carry dirty or crude oil. The advantages of this type vessel are they are more readily available and can deliver large quantities of POL products for DOD. A major disadvantage is that when these vessels carry crude oil it takes some time to clean and prepare them to carry refined products.

3. Large Crude Carriers

The large crude carriers are the largest class of tankers and are solely dedicated to the transportation of crude oil. The range in size from 100,000 to 400,000 DWT and

there are some being built that range from 400,000 to 800,000 DWT. These vessels are not militarily useful for carrying petroleum products due to their large size. [Jp4-01.2]

This section discussed the type of fuel tankers based on what type of product they may carry and the size of the vessel. How DOD determines that there is a requirement for additional tanker vessel capacity required to meet an emergency situation will be discussed in the next section.

F. VESSEL ACQUISITION AND ACTIVATION

Ships that are part of the Navy, MSC, and RRF are under the control of DOD. However, most ships that DOD utilize to move petroleum products are not under their direct control and are in the commercial sector. If these ships are required by DOD in both peacetime and wartime, then there must be an agreement between DOD and the private company owner and operator of the vessel. These agreements are called "charters". "Time" and "voyage charters" are most commonly used to acquire sealift shipping to meet short-term military requirements. [JP 4-01.2] A voyage charter is a one time agreement (contract) to move fuel from point-to-point. A time charter is an agreement (contract) for the use of the services of a vessel for a particular time period.

How does DOD determine the amount of sealift required to transport petroleum products? The previous section discussed five sources for DOD to utilize shipping fuel. The intratheater assets are the vessels of the Navy and MSC. There are various procedures that must be followed for intertheater sealift of fuel to the theater of operations. Appendix B provides the flow of events. In normal peacetime operations the

requirements are met or MSC will charter additional ships. In an emergency (wartime) more assets may be required. However, in Desert Storm the MSC met requirements by chartering additional vessels. This may be even more difficult in a dual MTW? The inactive vessels of the RRF and National Defense Reserve Force (NDRF) may have to be utilized. These vessels were not used during Desert Storm. Appendix's C and D provide the step-by-step procedures required to activate the RRF and NDRF fuel tanker assets. These vessels may not meet all the demand requirements in a dual MTW. Commercial shipping would have to be utilized. DOD would have to obtain shipping from the following sources:

- U.S.-flag commercial charters
- Foreign owned and operated ships, used in accordance with existing laws and policies
- Ships committed to the Voluntary Tanker Agreement (VTA)
- U.S. owned ships under Effective U.S. Control (EUSC)
- Military useful U.S.-flag ships which are subject to requisitioning [JP4-01.2]

An in-depth discussion of these sources of shipping will be discussed in the next chapter.

III. ASSETS AVAILABLE

A. INTRODUCTION

The assets available to move and deliver fuel in a dual MTW can be are the following categories:

- U.S. Navy
- Military Sealift Command
- National Defense Reserve Force/Ready Reserve Force
- Commercial
- Voluntary Tanker Agreement
- Other

A discussion of current and future projection of assets available in each category will be discussed next.

B. ASSETS AVAILABLE

1. U.S. Navy

U.S. Navy assets currently consist of eight fast combat support ships (AOE). There are two ship classes: Sacramento and Supply. Vital information on each is provided in Appendix F. The Sacramento Class is the largest underway replenishment ship in the world and can carry a variety of POL products including DFM and JP5. It is the older of the two classes. The Supply class can carry the same products, but is a newer ship. These vessels are not common user vessels. Common user vessels are vessels that can be used by all Service branches. These vessels are for Navy use only, but can also be

utilized by allied navies. They are an intratheater asset compared to other vessels (tankers) that are intertheater assets. The planned service life of these vessels is 35 years. As can be seen in Appendix F, the Sacramento class is approaching this milestone. The average age of this class is 32 years old. These ships are old and require much maintenance to keep them running. One solution to this problem of an aging ship is the introduction of a new class of Combat Logistics Force (CLF) vessel. This new vessel is the T-ADC(X). This vessel will be managed and operated by MSC just as other CLF vessels are. The first delivery will be in FY04 with a total of 12 ships delivered by the end of FY 2006. The T-ADC(X) will be able to carry fuel, stores, and ammunition. A major drawback to this ship is that it can only carry 18,000 BBLs of fuel. Because of this limitation, the Navy will need to continue to depend on the Kaiser Class Oilers for most of their fuel requirements. These oilers will be discussed in the next section. Currently the Navy depends on these oilers for much of its refueling requirements. The Navy may lose its flexibility of using the Sacramento Class AOE when the T-ADC(X) replaces it. However, at some point in the next 10 years all CLF vessels will probably be managed and operated by MSC. This will help the Navy alleviate some of its current manning shortages. These vessels of the MSC are discussed in the next section.

2. Military Sealift Command

The majority of CLF assets are operated by MSC. These civilian-manned vessels have assumed the role of fueling and supplying the fleet. MSC has five ship programs to serve not only the Navy, but also the entire DOD. These five programs are:

- Navy Fleet Auxiliary Force (PM1)
- Special Mission Ships (PM2)
- Prepositioning Ships (PM3)
- Ship Introduction Ships (PM4)
- Sealift Ships (PM5)

The only programs that are concerned with fuel tanker assets are PM1, PM3, and PM5. These programs will be discussed next.

a. Program 1 (PM1)

MSC's Navy Fleet Auxiliary Force (NFAF) is the lifeline to the U.S. Navy ships at sea. [MSC] These NFAF ships are crewed by civilian mariners and have a small detachment of Navy personnel onboard to provide communication and other technical support. This technical support includes the personnel required to land and take-off military supply helicopters. For Navy underway fuel requirements there are 13 underway replenishment oilers in active service. These oilers are all of the Kaiser Class. Two other Kaiser Class Oilers are currently being used as part of the prepositioning force. Information is provided in Appendix G. These oilers are not common user vessels and only replenish ships that are underway. They provide intratheater support for U.S. Navy and other allied force vessels. In a dual MTW they would not be used by any other service within the DOD. The average age of these vessels is less than 13 years old so they will be operating for approximately 20 more years.

b. Program 3 (PM3)

MSC operates more than 30 ships in the Prepositioning Program. Of these, three are afloat prepositioning tankers. The three are part of the Logistics Prepositioning Ships that support the Navy and the Defense Logistics Agency (DLA). All prepostioning ships are under the operational control of MSC area commands, directly supporting the Navy's fleet commanders in chief. [MSC] The actual day-to-day control of the ships is carried out by one of the three MPS squadrons. Information on these ships is provided in Appendix G and H.

c. Program 5 (PM5)

The mission of MSC's Sealift Program is to provide high quality, efficient and cost-effective ocean transportation for the DOD and other U.S. government agencies. [MSC] One area of this program is tanker support. MSC works closely with the Defense Energy Support Center (DESC) to transport petroleum products to DOD storage and distribution facilities around the world, as well as to deliver fuel to MSC oilers and other U.S. Navy fleet oilers at sea. MSC operates approximately ten long-term chartered tankers to provide 90 percent of all fuel needed by DOD during peacetime operations [MSC]. All of these vessels are common user tankers. Seven of these vessels are listed in Appendix G. Five of the vessels are T-AOT's and two are miscellaneous type vessels. Vital statistics on these vessels is provided in Appendix J.

3. National Defense Reserve Force (NDRF)/Ready Reserve Fleet (RRF)

The National Defense Reserve Fleet (NDRF) was established under Section 11 of the Merchant Ships Sales Act of 1946, to serve as a reserve of ships with value for national defense purposes. These ships can be activated to meet shipping requirements during national emergencies. [MARAD] A list of ten NDRF preservation ships is provided in Appendix H. Vessels with military utility or logistic value are held in retention status and are placed under a preservation program designed to keep them in the same condition as when they enter the fleet.

The Ready Reserve Force (RRF) program was initiated in 1976 as a subset of the NDRF to support the rapid worldwide deployment of U.S. military forces. The RRF is critical to ensuring that our Nation maintains the surge capability to respond unilaterally to security threats in geographic areas not covered by alliance commitments and otherwise meets sealift requirements in the event of crisis or war. [U.S. DOT]. The RRF is a key element in DOD strategic sealift especially in the critical surge period before commercial shipping can be marshaled. The Maritime Administration manages the RRF for DOD through contracts with Ship Managers and General Agents who are responsible for activating, maintaining, manning, operating, and deactivating the ships. [U.S. DOT]. The RRF ships are maintained in a readiness status of 4, 5, 10, 20, or 30 days. Each ship is expected to be fully operational and ready for sea to sail within the assigned DOD readiness. Ships in priority readiness (4 or 5 day) have a Reduced Operating Status (ROS) maintenance crew of 9 or 10 persons and are outported at government or

commercial berths. [MARAD] This is periodically tested by DOD in no-notice activation of selected ships. There are currently ten RRF tanker ships. Once RRF vessels are activated in support of a DOD operation they come under the control of MSC. Vital information on these ten ships is provided in Appendix H.

Five of the ships in the RRF are classified as Offshore Petroleum Discharge System (OPDS) tankers. These ships can discharge petroleum products from four miles offshore without any shore facilities. [U.S. DOT] Information on these is provided in Appendix H.

One major concern for the DOD is the age of the RRF fleet. As Appendix H shows, most RRF tanker ships were built in the 1950's and 1960's with one being built in 1945. Because of constraints on acquisition funding, this is not expected to improve in the near future. Another problem is having enough manpower to operate these vessels. Seafarer people are getting older and fewer people are becoming merchant marines. This will be discussed more in Chapter 4.

4. Commercial

The importance of the commercial shipping sector cannot be underestimated. This was evident by operations in Desert Shield/Desert Storm and continues today in operations in the Arabian Gulf and Kosovo areas of operations. This may be especially correct with regards to fuel tankers. The commercial fuel tanker sector can be into the following categories:

- U.S. Flagged Vessels
- Effective United States Control

- Foreign Flagged Vessels

a. U.S. Flagged Vessels

U.S.-flag vessels are commercial tankers owned by U.S. companies, their subsidiaries or U.S. citizens. In today's economic environment of global companies, the distinction between who owns a U.S.-flag vessel and a foreign flag may be difficult to determine. By partnering with the U.S.-flag commercial maritime industry, the U.S. government leverages "assured access" to a total network that includes not just vessels but also logistics, management services, infrastructure, terminals and equipment, communications, and tracking networks, as well as a cadre of well-trained, professional U.S. seafarers and shore-side employees. [U.S. DOT]. The U.S.-flag tanker fleet is supported by the Alaskan oil trade. Crude oil from Alaska is transported from Valdez to refineries on the West, East, and Gulf coasts. U.S.-flag tankers transport domestic crude oil to refineries and refined petroleum products to final markets. Under the Jones Act, U.S.-flag tankers enjoy exclusive rights to the domestic trade in crude and refined petroleum products. Domestic shipments of petroleum are the key factor in determining the size of the U.S.-flag tanker fleet, because U.S.-flag tankers transport only a small share of imported oil. High cost U.S. ship operators generally have not been competitive in international oil markets. [Rost]. The global demand for fuel tanker is also significant:

> The global demand for refined petroleum products also has significant influence on the tanker markets. The retirement of product tankers without replacement is one issue affecting the available numbers of these types of tankers. As tanker operators reevaluate their market share and position, they must determine the business sense of the recapitalization of their tanker fleets in relation to forecasted future profits. The U.S. merchant marine industry has abdicated its market share of the global product tanker trade in favor of exclusive Jones Act trading. The global commercial product tanker trade, therefore, is almost exclusively the purview of foreign marine ships. [Quintanilla]

To help understand the U.S.-flag tanker sector, the appendixes in back provide useful data. Appendix I indicates the total number of U.S.-flag oceangoing tanker vessels of 1000 gross tons (GRT) or over. This list includes all tankers: product, crude, chemical, and others. For military purposes Appendix J lists all the military useful U.S.-flag vessels. As chapter 2 discussed, a military useful vessel is one that between

In 1999 the U.S.-flag product tanker consisted of 63 vessels. Of these vessels, 62 are active and one is in lay-up. This is a decline of 40 ships since the summer of 1990. This is approximately a decline of almost 40% in one decade. See figure 1. In this same period only 10 replacement product tankers were built for domestic trade. [Kurz]. One important thing to note is that all of these vessels are in the Jones Act trades with no U.S.-flag product tanker in the foreign trades. Another problem is the age of the product tanker fleet. Today, the average age of the U.S.-flag product tanker is 21 years old. The average age in the world tanker fleet is 15 years. [Rost]

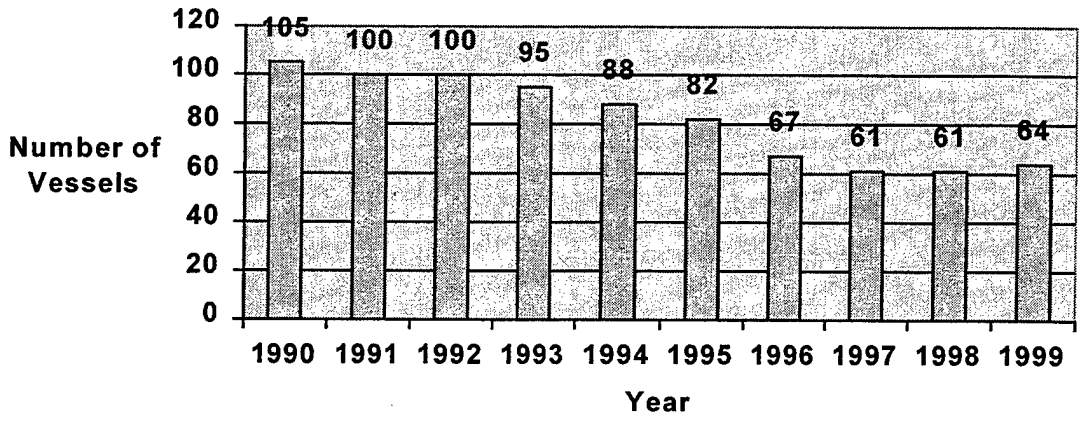

Figure 4. Decline of U.S.-Flag Product Tanker Fleet

The decline occurred in a short period of time. After the Exxon Valdez oil spill, Congress passed the Oil Pollution Act of 1990 (OPA 90). This law stated that all tankers carrying petroleum products must be double hulled by the year 2015. Although OPA-90 has played a role in the U.S.-flag fleet's decline, the major impact has come from diminished demand. The following factors have had a negative impact on demand in the 1990's:

1. Reduced MSC Demand: In 1990 MSC chartered 21 products on term charter versus five today, which is a 76% drop. Over the past 10 years MSC's spot product tanker charter requirements are down by at least 50%. These spot charters may be down, but MSC still has a valid requirement for them. As Appendix R indicates, MSC acquisitioned for 79 voyage charters between 1997 to 1999 from foreign flagged vessels. These charters delivered over 13 million barrels for fuel products at a cost of over $25 million dollars. In FY 1999 the number of voyage charters totaled 50. See Appendix S. Of these 50 charters, 19 were utilized for operations in Kosovo. These 19 charters

delivered over four million barrels of fuel at a cost of over $16 million dollars. Only two of these charters were accomplished by U.S.-flag vessels. MSC's product tanker charters are down over the past ten years but they still depend on them to meet the requirements of the forces in the battlefield.

2. Petroleum Product Imports: The U.S. continues to depend on the import of fuel products from foreign countries. These products continue to come into the U.S. at a very substantial level. The daily average for the decade has remained consistently about two million barrels per day. Because of this, high level of product imports has negatively impacted the need to make domestic movements and generally has created a ceiling for Jones Act product tanker rates.

3. Product Cargo Exchanges: The oil companies today are much more receptive to exchanging their respective cargoes as there is much greater compatibility between brands. This increase in product exchanges has come at the expense of waterborne movements of cargoes. These exchanges have helped eliminate the pollution risk associated with moving petroleum by water.

4. Oil Company Mergers and Consolidations: The number of oil companies has decreased due to the various mergers and joint ventures. What this does is reduce the overall demand of fuel product tankers because of the greater efficiencies created by the consolidation. [Kurz]

Another reason for the decrease in product tanker demand is the increased reliance on oceangoing barges for the delivery of product cargoes in the domestic coastwise trade.

As Table 1 indicates, as domestic product cargoes increased by 5.9 million tons between 1995 and 1997 (up 2%), tanker demand fell by 6.6 million tons (down 12%).

	1995	1997	Difference	Change
Tankers	57.4	50.8	-6.6	-12%
Oceangoing Barges	54.4	62.2	+7.8	+14%
Note: Tons (millions)				
Coastwide Product Trade	Up 1% (1.3 Million Tons)			
Domestic Product Trade	Up 2% (5.9 Million Tons)			

Table 1. Coastwide Product Trade

While barges can serve effectively in many of the same domestic trades as ocean going product tankers, including meeting domestic and regional military fuel requirements, they are less well suited for long haul requirements where higher vessel speeds are required. [Ibid]

As mentioned earlier, the product tanker fleet consists of 63 vessels with 62 of these being part of the active fleet. However, this number may be misleading. Not all vessels carry petroleum as currently 47 of these vessels are in product trade and 15 vessels are participating in the grain trades. Appendix J lists the various ships. Almost 25% of today's product tanker fleet are involved in a non-oil trade. What this indicates is a lack of Jones Act product demand, and demonstrates that the domestic product tanker fleet continues to be over-tonnaged [Ibid]. Over-tonnage meaning the supply capacity of fuel tanker vessels exceeds the demand for this capacity. If the 15 vessels were not in the grain trade they would probably be in lay-up due to the over-tonnage.

The numbers above indicate what is currently happening in the U.S.-flag product tanker fleet. This may change over the next ten years? This is the key question for DOD planners. Base load demand plus a minimal spot market margin, equates to an industry need for approximately 45 tankers. See figure 2.

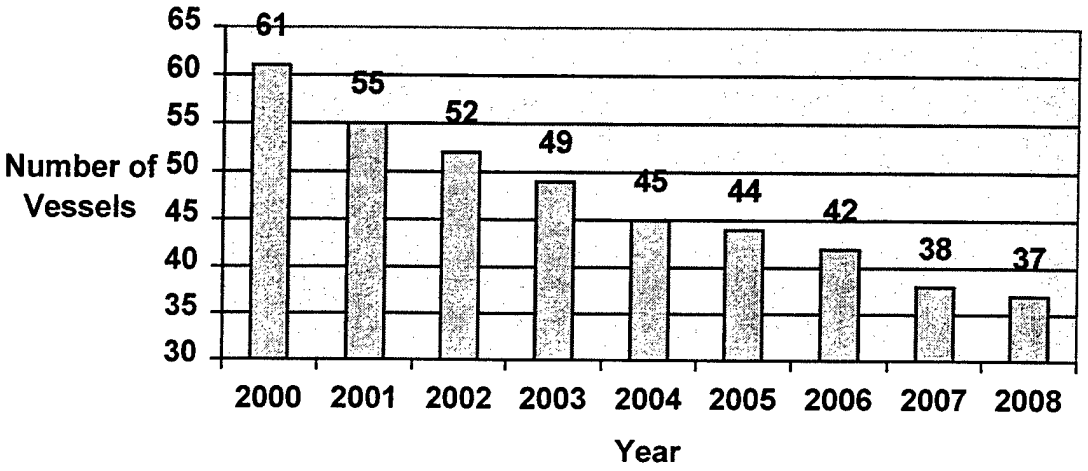

Figure 5. Product Tanker Forecast

The above figure indicates graphically how the continued reduction in fleet size propelled by OPA 90 retirements compares to a projected, sustained demand for 45 vessels. As can be seen, the supply and demand curves intersect in the 2004 year time frame. At that time there will be only enough product tankers to service core domestic requirements. After 2004, the industry faces a deficit situation in that there is potentially not enough equipment to meet core demand. These projections take into account that

there are currently no new product tanker vessels on order or being constructed and it is very unlikely that any contracts will be signed in the near future [Kurz].

To summarize, the main cause of the forecasted shortage fuel product tankers around 2004 is an assumed lack of construction of new vessels, and the phase out of older vessels because of OPA 90. Appendix M lists U.S.-flag tankers of 55,000 DWT and greater that will be phased out in the next ten years. Most of these are not military useful product tankers because of their large size. However, this lack any type of fuel tanker may have a great effect in a dual MTW.

The decline in the number of tankers has also had another great effect on the industry. Just as the number of U.S.-flag product tankers has dramatically declined since 1990, so have the seagoing job opportunities provided by this fleet. There were 6,180 billets provided by the tanker fleet in 1990. This compares with 3,840 in 1999, almost a 40% decline in one decade. (See figure 3). As the number of seagoing billets lessen, the number of qualified seagoing mariners will also lessen. This has a tremendous impact on both the commercial tanker fleet, but also the RRF fleet. This will be discussed in Chapter IV.

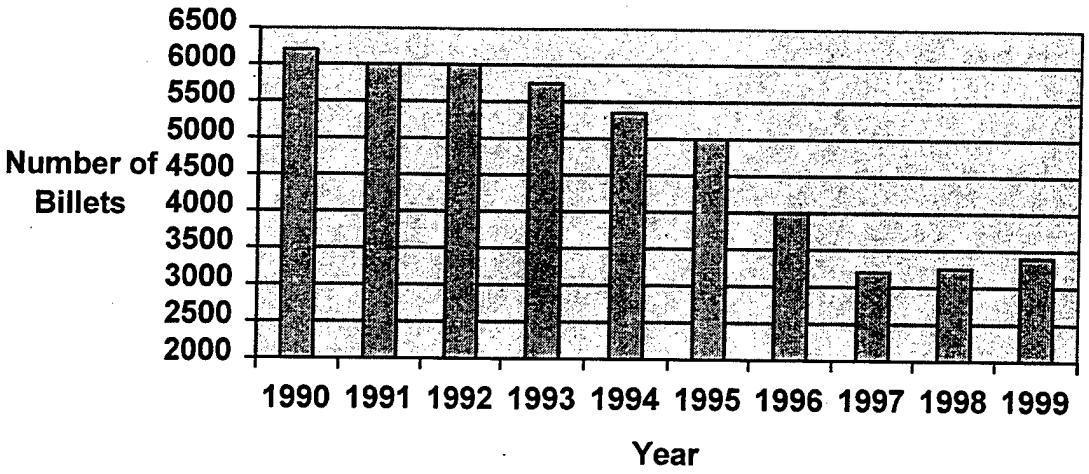

Figure 6. Decline in Tanker Billets

b. Effective United States Control

Effective U.S. Controlled (EUSC) tankers are those vessels that fly the flag of Bahamas, Honduras, Liberia, Panama, or Republic of the Marshall Islands and are available for use by the DOD during war. These vessels are U.S. owned, but are registered in their respective countries. A list of these ships is provided in Appendix O. There are no tankers from Honduras currently on this list. MARAD is responsible for providing U.S.-owned foreign flag ships for military support in time of war and will nominate such ships to meet each requirement stated by MSC. MSC, in conjunction with the Deputy Chief of Naval Operations for Mobility and Sealift (N42), will determine the military suitability of those ships nominated. [JP4-01]

What does this EUSC really mean? Four Things:

- Access by normal charter or U.S. requisition

- Requisition requires Presidential declaration of national emergency (not since WWII)
- Law of flag state does not impeded requisition
- Not based on treaty or government agreement [Kurz}

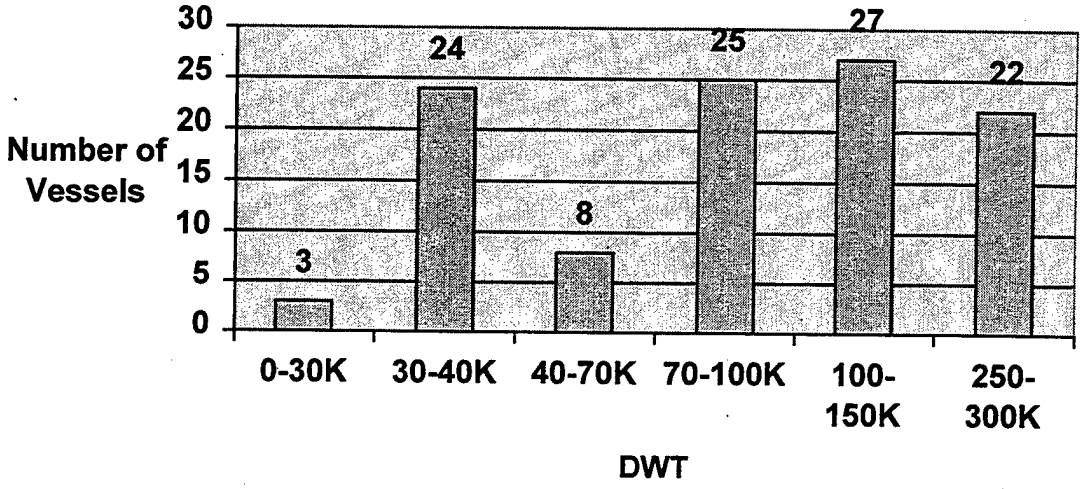

Figure 7. EUSC Tanker Fleet

c. Foreign Flagged Vessels

Appendix N lists major merchant tanker fleets of the world. The U.S. lags behind many countries. The top four countries by dead weight tons (DWT) is provided in Table 2.

Country	# Ships	GRT (000)	DWT (000)
Liberia	698	38,820	57,659
Panama	985	27,396	47,516
Greece	262	19,398	25,516
Bahamas	249	12,952	23,670

Table 2. Top Four Tanker Fleets in the World

All of these countries except for Greece have vessels in the EUSC that can be utilized by DOD in a war. These countries have many more ships for a variety of reasons. These reasons include lower construction costs, lower crew wages, lower tax rates, less government regulations and lower safety standards. These registries may not require the same level of protection for seafarer health, welfare and safety as on U.S.-flag vessels. [U.S. DOT] The major question is can the DOD depend on foreign flagged vessels in peacetime and wartime. This will be discussed in depth in the next chapter.

5. Voluntary Tanker Agreement

The Voluntary Tanker Agreement (VTA) is an agreement established by the Maritime Administration to provide for U.S. commercial tanker owners and operators to voluntarily make their vessels available to satisfy DOD needs. It is designed to meet contingency or war requirements for point-to-point POL movements and not to deal with capacity shortages in resupply operations. [JP 4-01.2] It was established in 1951, revised in 1983, and is reapproved biennially. A list of these ships is provided in Appendix K. The activation procedures for the VTA are provided in Appendix F. The VTA will be activated if MARAD determines the following:

- A tanker capacity emergency affects the national defense
- Defense requirements cannot be met by chartering
- Defense requirements can be met more efficiently by activating the VTA then by requisitioning ships [JP 4-01.2]

There is some debate about whether these ships will be available to DOD in a contingency operation. This will be discussed in the next chapter.

6. Other Vessels

For the purposes of this thesis, other vessels are those vessels that may be available to the DOD during a military operation. These vessels may come from NATO and South Korea. Appendix Q is a current list of the NATO flag tanker fleet. Appendix R is a list of possible Korean flagged ships that would be provided in a contingency involving the Korean peninsula. The ships listed in Appendix Q are of different sizes and product carrying capabilities. NATO member governments have agreed to make some of their national shipping assets available to the U.S. in order to aid in meeting emergency requirements in support of their own nation or other signatories of the North Atlantic Treaty. [JP 4-01] The Republic of South Korea has committed to providing a small group of ROK ships. The vessels listed in Appendix R would be available exclusively for DOD in a military operation. However, there are only 12 of them and the sizes are limited. They would help in the operations for the use in smaller ports, but larger tankers would be required.

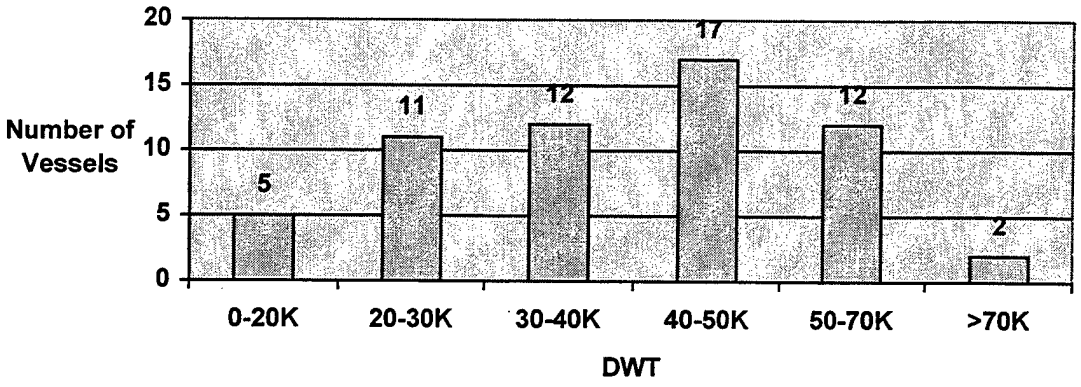

Figure 8. NATO Flag Tanker Fleet

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IV. ANALYSIS

A. INTRODUCTION

The importance of fuel tanker vessels in both peacetime and wartime cannot be underestimated. Sometimes it is taken for granted the ease at which fuel is provided to the forces. In a dual MTW these assets become extremely vital to the operations.

> The transition from peace to conflict represents a critical period for sealift. Management of the transition during this period will have a significant effect on the success of deployment and sustainment missions assigned to sealift. Lost time is rarely made up, and it is particularly during the transition period that time is lost. Lost time can be attributed to misperceptions about the speed with which the DTS in general, and sealift in particular, can transition from a relatively small peacetime force to a major military force. Depending on the mode of acquisition (discussed in chapter II), ships may be delayed for significant time periods before they can be considered as active sealift vessels. [JP 4-01.2, p.VIII-1]

These sealift asset availability times are provided in Table 3.

TYPE	DAYS
ROS Shipping	4-7
Charter	4-30
RRF	5-20
VTA	21-75
Requistioning	14-45
NDRF	45-135

Table 3. Sealift Asset Availability Times

The three fastest modes are ROS and RRF (government-owned) and charter (commercial-owned). One concern is the last three modes of VTA, requisitioning, and MDRF have never been tested in a contingency operation. During this transition from

peacetime to wartime, several factors may complicate the rapid accumulation of sufficient shipping, particularly the acquisition of ships from the RRF and NDRF. These factors include:

1. The frequency of reserve ship test activations and exercises
2. Maintenance effort expanded on reserve shipping
3. Shipyard capacity to activate large numbers of ships
4. Availability of trained crews, spare parts, and logistic support
5. Availability of militarily useful shipping on the world charter market,
6. Restrictions on the activities of foreign flag ships by their respective national governments [JP 4-01.2]

As an example of the importance of liquid cargo carriers one must look at what happened during Desert Shield/Desert Storm. At the outbreak of hostilities on 16 January 1991, the MSC force numbered 43 tankers: 25 moving POL, 11 serving as floating storage vessels in theater (7 for fuel and 4 for water), 6 for refueling operations, and 1 OPDS vessel. During the entire operation, MSC used 69 tankers: 4 RRF, 38 U.S.-flag, and 27 foreign flag. [Holt] MSC used three main sources of vessel capacity during this operation. In a dual MTW they would be utilized in the same manner. Because of this, the analysis will focus on the following areas:

1. Ready Reserve Force
2. U.S.-Flag
3. Foreign Flag

B. READY RESERVE FORCE

It is foreseen the RRF has two main problems: the age of the vessels and the manpower required to operate these vessels. As mentioned earlier, the 10 tankers in the RRF are considered old with most being built in the 1950's and 1960's. The cost to maintain these in a ROS is considered expensive. Another concern is that it has not been determined is if these ships can operated underway for long periods of time, such as a dual MTW. The other problem is manning.

> The RRF has a natural limit, one that is determined by the size of the commercial fleet. The availability of both merchant sailors and shipyard capacity depends upon the total fleet of tankers. If the overall fleet declines too much, not enough merchant mariners would be available to operate RRF tankers, and enough shipyard capability to activate the reserve tankers in a timely fashion may not exist. Under such circumstances a relatively large RRF would not be feasible. Even if maintaining a large number of tankers in the RRF is cheaper than subsidizing them in commercial operations, the RRF is not necessarily the best policy choice. [Rost]

If the active commercial fleet continues to decline, as appears likely, unemployed or underemployed sailors will switch occupations. Additionally, it is expected more commercial yards will close. Furthermore, in an era of increasingly austere defense budgets, a large tanker RRF simply may not be affordable. [Rost] The RRF will play an integral role especially in the early stages of a contingency. However, RRF can not meet all the requirements. DOD will have to charter vessels from both U.S.-flag and foreign flag companies.

C. U.S.-FLAG

Like other profit-oriented corporations, vessel owners will register their ships under the U.S.-flag only if there is a measurable economic benefit to their shareholders. Because of higher U.S. construction, maintenance, environmental, and safety standards, it almost always costs more to operate U.S.-flag vessels than it does to operate foreign flag ships. [Navy League]

Unfortunately, America's maritime industry is now in extremis, and no bailout is likely, unless and until there is a sea change of attitude in the administration, in the Congress, and among the American people. [1999 Almanac] The U.S. is the largest trading nation in the world, but U.S.-flag vessels carry less than three percent of its foreign trade. Overall, it is concluded the U.S.-flag tanker vessel fleet is aging and declining.

Commercial tanker capacity under U.S.-flag has been declining and is expected to continue doing so in the next few years. In the event of a major armed conflict, it is unlikely that U.S.-flag tankers would be capable of providing adequate logistical support for both U.S. armed forces and essential economic activity. [Rost]

In an interview to *Seapower* magazine, Mr. Clyde J. Hart, Jr., Administrator of the Maritime Administration is quoted as saying "the U.S. is better prepared today to meet the sealift requirements of a crisis comparable to Desert Shield and that the U.S. has the surge and sustainment capacity that we would need. [Seapower] Since the Gulf War there has been great improvements in sealift capabilities for the armed forces.

Unfortunately, these improvements were not in the tanker vessel capacity. In fact, it has declined dramatically and probably will continue to do so. Of nine U.S.-flag tankers chartered by MSC during the Gulf War, only three are still trading today. [Kurz] Chapter III indicated that it is expected after 2004/2005 there will be a shortage of U.S.-flag tankers to meet U.S. domestic needs. This decline in the number of vessels will reduce the pool of skilled labor and the U.S.-flag capacity will not be available in a dual MTW.

D. FOREIGN FLAG

Many nations have been building an international maritime presence as a means of projecting national and maritime visibility and to earn hard currency.

> The global ocean tanker trade route architecture influences the taker market through the placement of ships near potential cargoes and distribution centers. Refined petroleum products emanate from refining centers throughout the world. In the event of war, the U.S. would be seeking to contract with tanker operators whose ships were in close proximity to suppliers of military grade fuels. The market supply of ships cannot expand to assume the commitments of routine trade and international emergency concurrently. [Quintanilla]

Although foreign flag vessels were available and chartered during the Gulf War, it is questionable whether future crisis will have the consolidated international effort that was the trademark of this war. It is much more likely that future conflicts will lack this international consensus, thereby making U.S.-flag sealift capacity even more critical. [Kurz]

The biggest concern of using foreign flag vessels is can the ships and the crews be depended on during a wartime situation. The risk of shipping and crewing accessibility is shown in Figure 9.

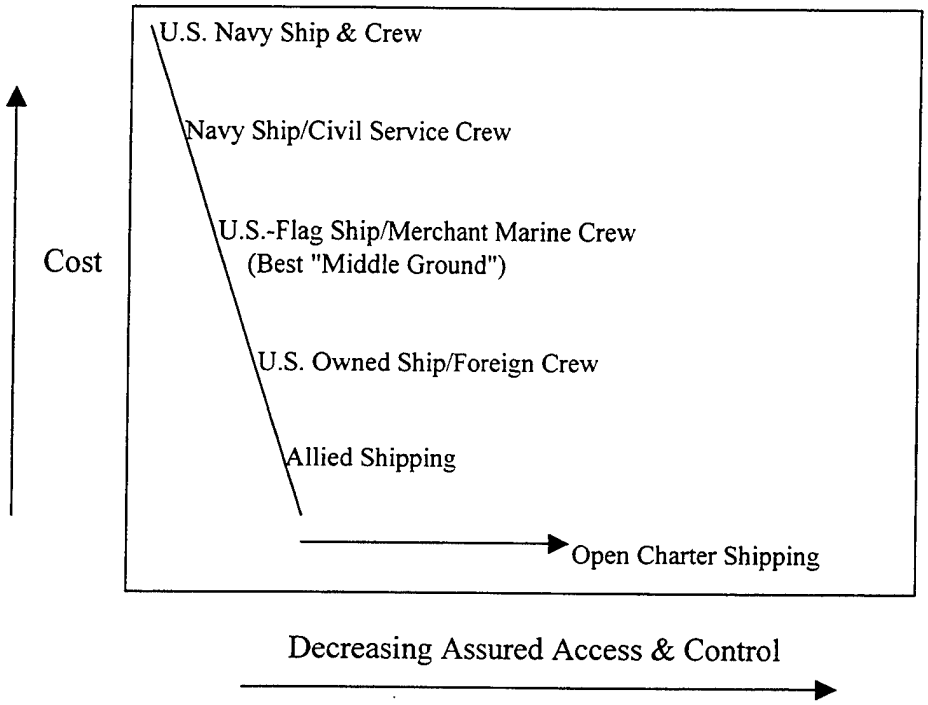

Figure 9. Risk of Shipping & Crewing Accessibility

The DOD chartered foreign flag vessels in a number of roles during Desert Storm. However, some myths must be discussed on how well they worked. These vessels were of all types and not just tanker vessels. These myths are considered to be:

1. Cost Less: averaged $50 more per ton than U.S.-flag ships
2. More Efficient: 150 foreign flag ships carried only 21% of cargo; U.S.-flag ships carried 79% (this may be misleading because there was not enough information on how this foreign flag ships were actually used)

3. As Reliable: 13 foreign flag vessels hesitated or refused to enter into the Arabian Gulf
4. As Safe: 40% were from registries on the U.S. Coast Guard "blacklist" for safety violations [Kurz]

It has been established that there will not be enough RRF and U.S.-flag capacity to meet the requirements in a dual MTW. DOD could then activate the VTA and EUSC vessels as discussed earlier. However, the VTA program appears to have its shortcomings. First, the program has not really been activated and tested. If so, it would probably cause great disruption in the commercial market. Two, many of the vessels are not considered military useful mainly because if their size and type product they currently carry. Third, not all vessels are of U.S.-flag. It goes back to who controls the vessels. On paper and for DOD planning purposes it looks to be very useful. However, it must prove that it works. It must be tested to find out.

The second program that will be necessary to activate in a dual MTW is the EUSC program. Appendix O lists the ships currently in this program and it was discussed in previous chapters. This also has some serious shortcomings. They are as follows:

1. These requisitioned (or chartered) vessels may come with or without crews.
2. These vessels may lack essential equipment and infrastructure.
3. No assured access commitment for military use equals risk.
4. No controls on flagging outside U.S. control [Kurz]

One of the key questions is will foreign crews be willing to crew a vessel that may enter into dangerous waters for the purpose of promoting U.S. interests? It will depend

on the ship, its crew, and the situation. Unfortunately, this makes planning very difficult. As with the previous program, it looks good on paper but it is really questionable it can work unless DOD activates and tests it at least once. Another option for DOD is the use of foreign flag vessels and this will be analyzed in the next section.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

As can be seen by the information provided in the previous chapters, the maritime issues and challenges facing the nation and especially the military are significant and complex. Changes in world political trends and economies, domestic and international public sector budget priorities, and state-of-the-art technologies occur constantly. Despite advances in transportation, the U.S. continues to depend primarily on oceanborne shipments for its international trade and movement of military supplies during a conflict. [U.S. Dot]. As the U.S. begins the 21st century, there are serious doubts and great debates amongst military planners that there will be enough product tanker vessels within DOD and under U.S.-flag to meet the sealift requirements of moving petroleum products to the forces during a dual MTW. This assumption is based on a major war or engagement some distance from U.S. shores. There appears to be a great amount of optimism on the part of government and military agencies involved with acquiring product tanker lift that the world market will respond to the crisis without serious economic or strategic military penalty. [Quintanilla]

The DOD must address this problem of the lack of fuel tanker vessels that will be available to them in an emergency. This is important because successful response to regional contingencies depends on sufficient strategic mobility assets in order to deploy combat forces rapidly and sustain them in a theater operations as long as necessary to meet U.S. military objectives. [JP 4-01.2]

The previous chapters discussed in-depth what assets are available now and in the future to meet these military requirements. There are not enough government-owned assets to meet these requirements. By years 2004/2005 there will not be enough U.S.-flag tanker vessels to meet domestic needs let alone the needs of the military during war. There are many reasons for this lack of fuel tanker assets.

> There are political and economic forces at work today in the international marketplace that are have devastating and long lasting consequences for our merchant marine. The deterioration of the commercial fleet has been evident for years, due to subtle causes which were never intended to contribute to the loss of this valuable national asset. Indeed the reasons for the decline are so complex and interrelated, that neither labor, business nor government agencies can be assigned the responsibility. Ship companies are coping with a situation not entirely of their own making. Their higher rates are largely the result of federal regulatory requirements, safety mandates, the demands of labor and the absence of an equitable and consistent maritime policy shared by all governments of the world. The U.S. is damaging its own interests by letting foreign interests undercut our rates while maintaining rules and regulations which prevent our carriers from matching them. We can promote a free enterprise system within our own borders, but failing to support our own high seas fleet does not correct competitive imbalances throughout the world. [Smith, p. 134]

There are many things that must be done by the U.S. government and DOD to correct the situation. This will be discussed in the next section.

B. RECOMMENDATIONS FOR DOD

The problems have developed over many years and cannot be corrected overnight. It is both a political and cost issue. The DOD and other U.S. government agencies (specifically the Maritime Administration and the Military Sealift Command) must

ensure that there will be enough fuel tanker assets available to satisfy the demands of the military. Here are a few recommendations in order of priority to solve some of these problems:

1. Use of Foreign Flag Vessels

The following is the most important, yet most controversial recommendation of all. Unless something changes drastically in the next four to five years, the demand for U.S. product tankers may well exceed the supply due to the phase out of current tankers that do not meet OPA 90 requirements and the lack of new ship building construction. This demand is in normal economic activity of the U.S. and does not consider increased demand by DOD during war. Because of this, DOD planners must consider the use of foreign flag vessels in their OPLANS. There are many positives and negatives with such an idea as discussed in chapter IV. Unfortunately, DOD may not have a choice in the next few years. It was surmised during Desert Storm and operations in Kosovo that foreign flag vessels chartered by MSC can deliver petroleum products to the forces with limited problems. In a dual MTW, foreign flag vessels will have to be used. There are not enough U.S. assets to fulfill all fuel requirements. Because of this, DOD (especially MSC) should develop the partnerships and agreements now with the owners of this vessels so that in a time of crisis these sealift assets will be available. Chartering foreign flag vessels does work as can be seen by Appendix's R and S. Developing formal agreements with these foreign flag vessels will ease the transition from peacetime to wartime if it becomes necessary. Politics within our government and foreign

governments may play a key role in this. Public opinion from the tanker industry will voice doubts about this plan. There are concerns about this recommendation but at the present time this is the most efficient and effective way to meet the needs of the DOD.

2. Ready Reserve Force

As discussed earlier, the RRF is a vital component of DOD sealift capabilities. RRF is extremely important in the early stages (buildup) of a conflict until commercial sources can be marshaled. Some recommendations include:

- Full funding of the RRF annually in order to maintain the present readiness status of the ships to ensure that the ships are maintained in an appropriate state-of- readiness so that they can meet the requirements when activated.
- Add/replace ships currently in RRF. There are ten tankers in the RRF. This is not a sufficient number, it is forseen. Plus, the age of these ships is a major concern. These ships may have to be underway and operate for long periods of time. They should be able to do so without maintenance problems. Due to the age of these ships, they do not comply with the requirements of OPA 90 requiring all vessels carrying petroleum products to be double hull by 2015. These vessels should be replaced, but budget constraints may not allow this.

3. Maritime Security Program (MSP)

This program currently funds U.S.-flag vessels in order to ensure they remain U.S.-flag and be available for use by the DOD. This has been very successful to date.

However, there are no liquid cargo carriers currently in the program. The Maritime Administration needs to request and Congress needs to approve increased funding so that fuel tankers can also be in the inventory within this program. This may not be necessary today, but probably will be by the year 2005 when demand for U.S-flag tankers will exceed the supply due to the phase out of tankers that don't meet OPA 90 requirements. Subsidizing U.S. corporations within this program may encourage them buy new tanker vessels and to maintain a fleet of U.S.-flag vessels. The MSP is the best way for the U.S. to have total access and control of fuel tanker vessels during an emergency.

4. Voluntary Tanker Agreement/Effective U.S. Control

These voluntary programs look and sound good on paper, but they have never been tested. There is great concern within DOD and the commercial sector that such plans work. DOD should activate the ships and cause a potential disruption in the charter market. This will test how well the commercial sector can respond to the requirements of the DOD. This would be a very expensive test, but the results will help DOD planners in the long run. In a time of asutere budgets this may not be practical. If this is the case, a simulation or "war gaming" must be done. When doing this encourage industry representatives to participate in the simulation and provide input to the capabilites of the industry.

5. Public-Private Partnerships

In two reports to Congress, MARAD discussed the significance of developing such partnerships between the government and private sector. A collective public and

private approach to support and sustain the Nation's capacity of uninterrupted rapid deployment of U.S. forces should be developed and implemented. [U.S. DOT] This has been done well in other sealift areas such as containerships. It has not been done for fuel tanker vessels. It needs to be developed especially if the projections hold true of a domestic product tanker shortage around years 2004/2005. The DOD depends on the commercial sector to meet its needs so develop partnerships such as the MSP within the industry to meet these needs.

6. Cabotage Laws

The Jones Act and other U.S. cabotage laws that allow only U.S.-flag vessels to ship products within U.S. waters guarantee our Nation's control of essential transportation assets and their related infrastructure in both peace and war. {MARAD] A commitment to these existing laws will help strengthen our sealift operations in a wartime situation and support our civilian economy. These laws need to remain strong and active, yet they play only a small part in the overall picture of what fuel tanker assets are available.

These six recommendations are varied and complex. Unfortunately, the answer to many of the problems with regards to the number of fuel tanker assets available in a dual MTW is monetary, both within the government and commercial sector. In this era of austere budgets for military programs this may be difficult if not impossible to solve. However, by increasing the budget now this may improve the current programs and solve future problems for DOD planners. DOD must work with industry to solve these

problems. This industry includes both U.S. and foreign corporations. Creating partnerships can assist both parties in meeting their objectives.

C. SUGGESTED FURTHER STUDIES

This thesis developed a database of fuel tanker vessels available to DOD in a dual MTW and discussed why the number if U.S.-flag/U.S. controlled vessels will fall short of meeting military demand. Now that a current database of current and future assets in both the government and commercial sector has been developed, what further studies may be utilized? First and foremost, the Joint Staff and the CINCs must provide what fuel requirements are necessary in a contingency operation. Requirements from surge to sutainment must be known. Based on these requirements a projection can be made of the total number of vessels required. This should solidify the point that there are not enough government-owned and U.S.-flag vessels to meet the demands of a dual MTW.

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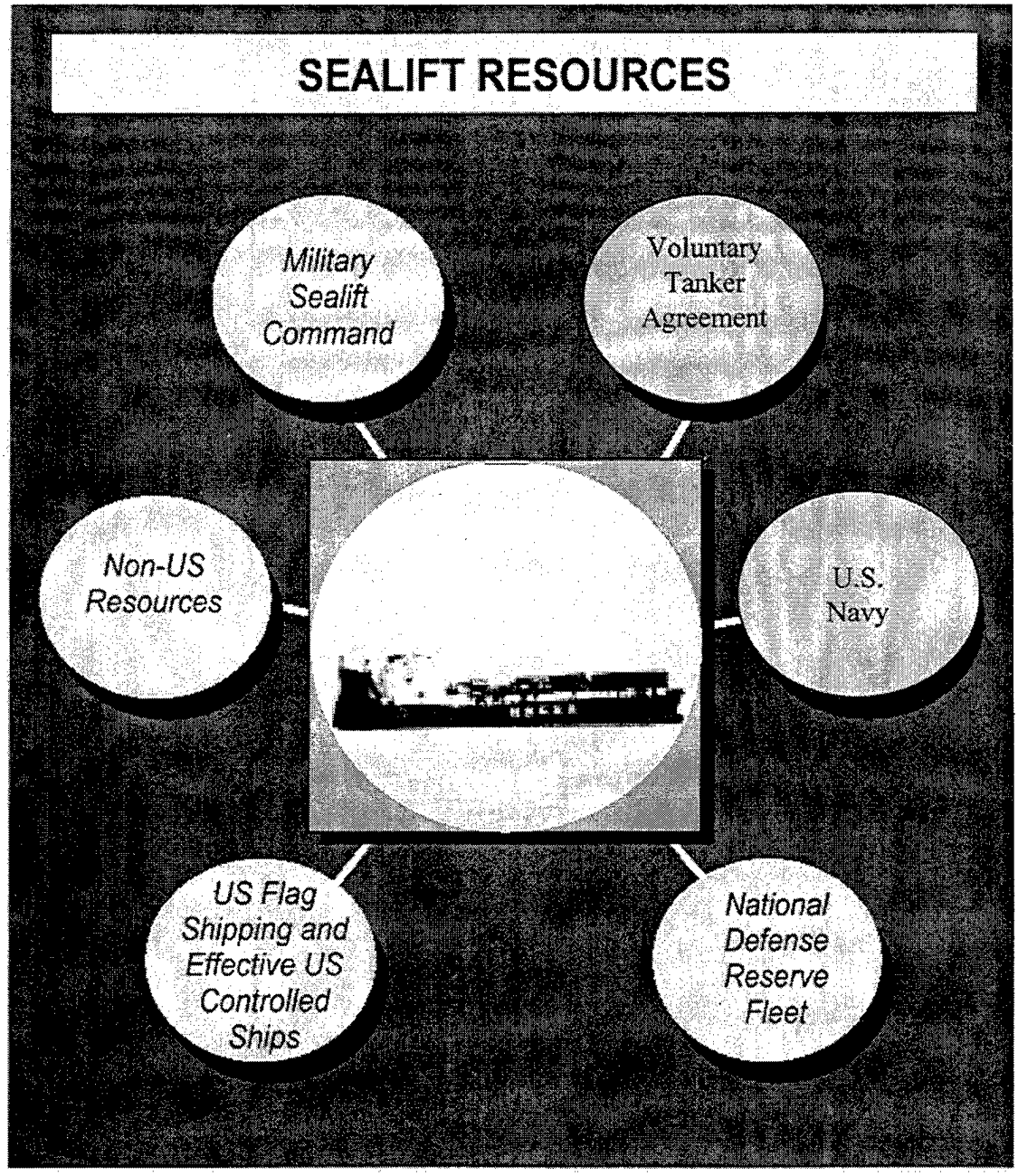
APPENDIX A. SEALIFT RESOURCES



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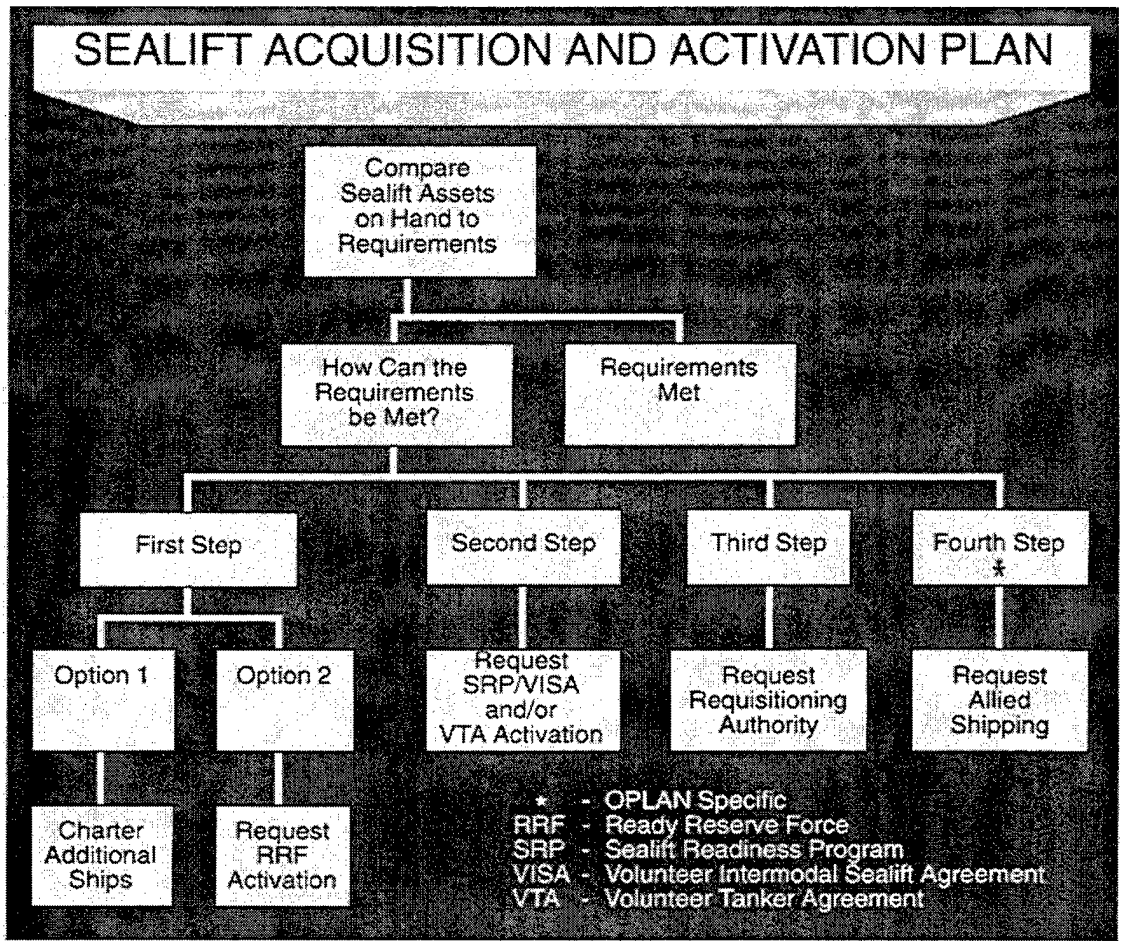
APPENDIX B. SEALIFT ACQUISITION AND ACTIVATION PLAN



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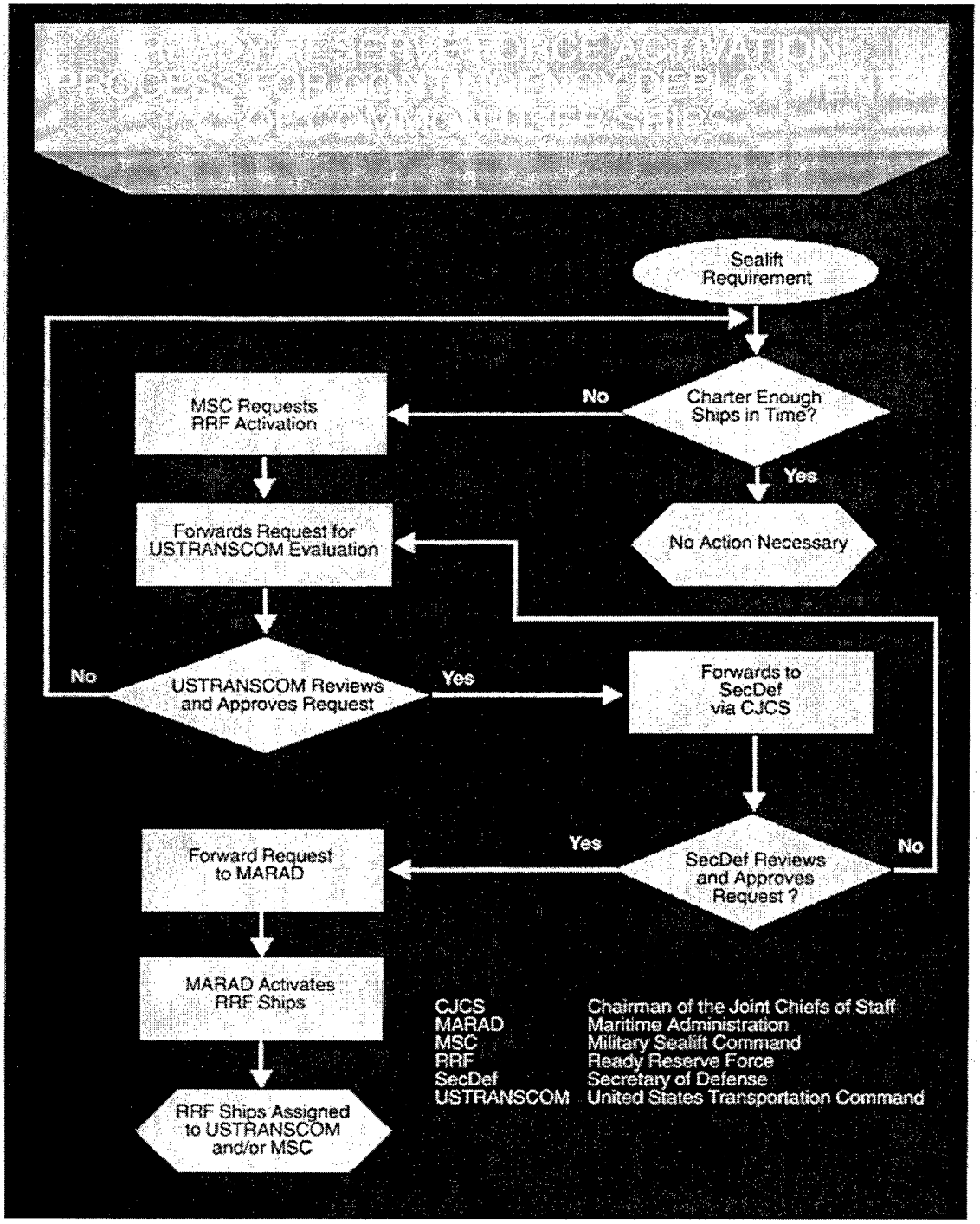
APPENDIX C. READY RESERVE FORCE ACTIVATION PROCESS



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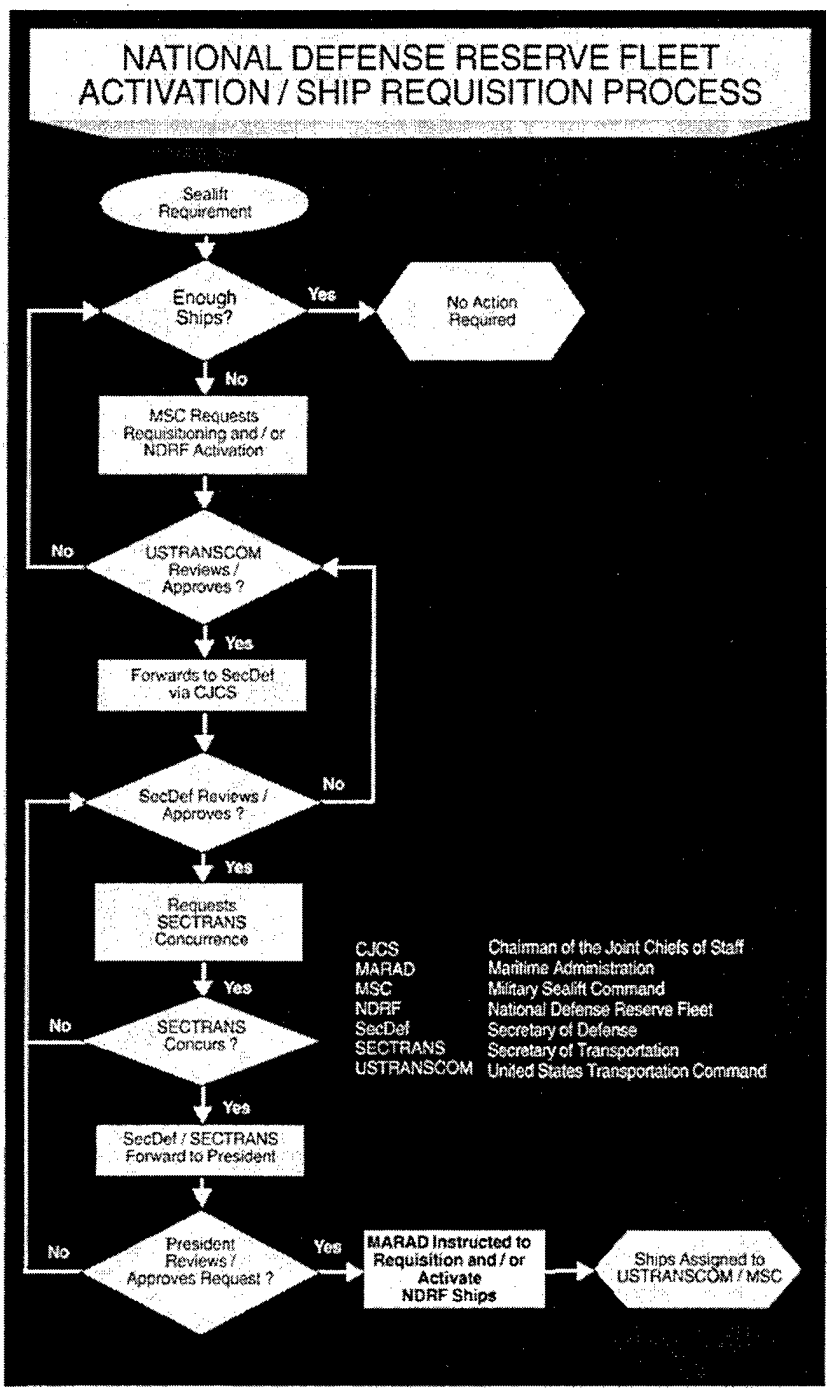
APPENDIX D. NATIONAL DEFENSE RESERVE FORCE ACTIVATION PROCESS



Source: JP 4-01.2

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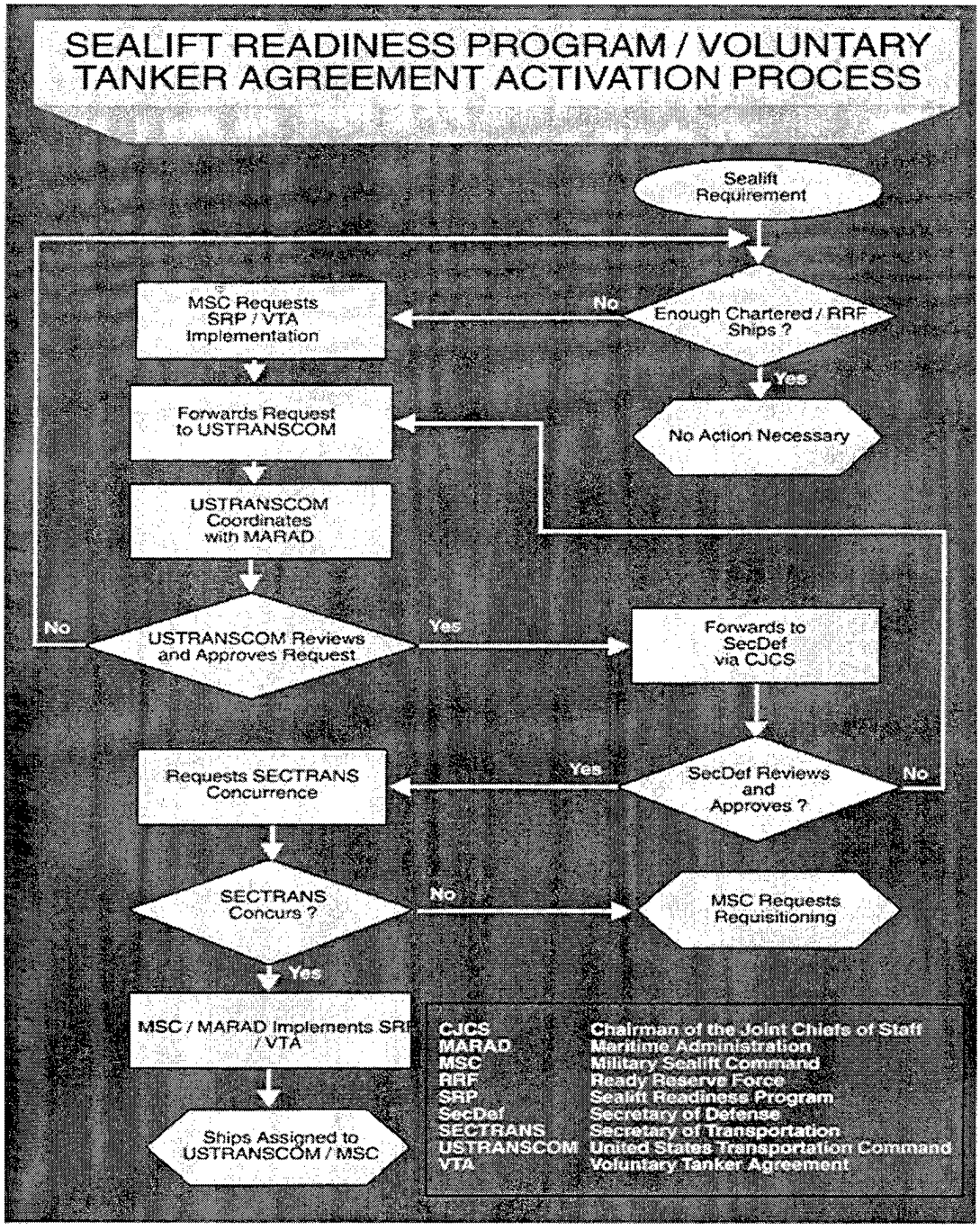
APPENDIX E. VOLUNTARY TANKER AGREEMENT ACTIVATION PROCESS



Source: JP 4-01.2

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APPENDIX F. UNITED STATES NAVY ASSETS

Class: Sacramento (AOE 1)

Names: USS Sacramento (AOE 1)
USS Camden (AOE 2)
USS Seattle (AOE 3)
USS Detroit (AOE 4)

Avg Age: 32 years

Fuel Cargo Capacity: 177,000 BBLs

Class: Supply (AOE 6)

Names: USS Supply (AOE 6)
USS Rainer (AOE 7)
USS Arctic (AOE 8)
USS Bridge (AOE 9)

Avg Age: 4 years

Fuel Cargo Capacity: 156,000 BBLs

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APPENDIX G. MILITARY SEALIFT COMMAND (MSC) ASSETS

Navy Fleet Auxiliary Force (PM1)

Class: Kaiser (T-AO)
Total: 13
Names: USNS Big Horn
USNS Diehl
USNS Ericcson
USNS Grumman
USNS Guadalupe
USNS Kanawha
USNS Laramie
USNS John Lenthall
USNS Patuxent
USNS Pecos
USNS Rappahannock
USNS Tippecanoe
USNS Yukon
Avg Age: 8 years
Fuel Cargo Capacity: 178,000 BBLs

*Future Assets
Class: T-ADC(X)
Total: 12 by end of FY2006
Fuel Cargo Capacity: 18,000 BBLs (DFM 10,500; JP5 7,500)

Prepositioning Ships (PM3)

Total: 3
Names: Kaiser - can be used as a tanker; located in Diego Garcia
Petersburg (OPDS) RRF; OPCON to MSC
Potomac (OPDS) RRF; OPCON to MSC

Sealift Ships (PM5)

Total: 7
Names: Gus W. Darnell, MV
Paul Buck, MV
Samuel L. Cobb, MV
Richard G. Mathieson, MV
Lawrence H. Gianella, MV
Valiant, MV (Misc)
Allegience, MV (Misc)

APPENDIX H. TANKER VESSELS IN THE NATIONAL DEFENSE RESERVE FORCE

Ready Reserve Force (RRF) Tankers - 10

Vessel	Hull #	Built	GRT (000)	DWT (000)	Assigned Location	Program Status	Status Remarks
Alatna	T-AOG81	1955	3	5	Tsuneishi, Japan	Military useful; retention	MOGAS tanker
American Osprey	OPDS-2	1958	20	34	Beaumont, TX	Military useful; retention	Replaced by Petersburg
Chattahoochee	T-AOG82	1957	3	5	Tsuneishi, Japan	Military useful; retention	MOGAS tanker
Chesapeake	OPDS-3	1964	21	50	San Francisco, CA	Military useful; retention	
Mission Buenaventura		1968	20	38	Beaumont, TX	Military useful; retention	
Potomac	OPDS-1	1957	15	27	Diego Garcia	Operational (Phase 0 Ret)	MSC Opcon; APF
Mount Washington	OPDS-5	1963	27	47	Houston, TX	Military useful; retention	
Petersburg	OPDS-4	1963	27	50	Guam	Operational (Phase 0 Ret)	MSC Opcon; APF
Mission Capistrano		1971	20	37	Beaumont, TX	Military useful; retention	
Nodaway	T-AOG78	1945	3	4	Tsuneishi, Japan	Military useful; retention	MOGAS tanker

National Defense Reserve Force (Preservation) Tankers - 10

Vessel	Hull #	Built	GRT (000)	DWT (000)	Assigned Location	Program Status	Status Remarks
Maumee	T-AO149	1956	15	27	Beaumont, TX	Hold (spare equip); retention	Hold for RRF (Potomac)
Mount Vernon		1961	27	47	Beaumont, TX	Military useful; retention	
Pride II		1959	16	30	Beaumont, TX	Hold (spare equip); retention	Hold for RRF
Sagamore		1959	1	2	Suison Bay, CA	Hold indef; retention	DOT-SBRF fleet utility
Pennsylvania Trader		1963	20	34	Beaumont, TX	Military useful; retention	
Shoshone	T-AO151	1957	15	27	Suison Bay, CA	Military useful; retention	
Maryland		1963	16	26	Beaumont, TX	Hold (spare equip); retention	
Lexington		1958	19	41	Beaumont, TX	Military useful; retention	
Adonis		1966	38	81	Beaumont, TX	Military useful; retention	
American Explorer	T-AO165	1958	14	24	Beaumont, TX	Military useful; retention	

Source: "Fleet Inventory", Maritime Administration (January 10, 2000)

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APPENDIX I. U.S. FLAG OCEANGOING SELF-PROPELLED TANKER VESSELS OF 1.000 GROSS TONS AND OVER (AS OF 4/1/99)

STATUS (OWNERSHIP)	NO.	DWT (000)
Grand Total	158	9,486
Active Vessels	123	7,914
Privately Owned	122	7,897
U.S. Foreign Trade	19	1,139
Foreign-to-Foreign	13	1,059
Domestic Trade	83	5,504
Coastal	56	2,271
Non-Contiguous	27	3,233
MSC Charter	7	195
Government Owned	1	17
Ready Reserve Force (RRF)	-	-
Other Custody	1	17
Other Reserve	-	-
Inactive Vessels	35	1,572
Privately Owned	8	703
Laid-up/Not trading *	7	669
Laid-up/(MARAD Custody)	1	34
Government Owned (MARAD Custody)		
Ready Reserve Force	10	869
Other Reserve (NDRF)	9	342
Non-Retention **	8	223

Note: includes Integrated Tug/Barges; excludes Great Lakes Vessels

*Vessels idle more than 30 days

**Vessels not actively maintained

Source: "U.S. Merchant Marine Data Sheet", Maritime Administration (April 1, 1999)

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APPENDIX J. MILITARY USEFUL U.S. FLAGGED VESSELS

VESSEL	TYPE	IC	DWT	BUILT	REBUILT	J A	VTA	STATUS
CHEMICAL PIONEER	Chemical Tanker	1	34928	6/1/68	6/1/83	Y	Y	Double hull
CHILBAR	Chemical Tanker	1	39363	3/1/59	6/1/81	Y	N	Double hull in 2006
HMI DYNACHEM	Chemical Tanker	1	51666	9/1/81		Y	Y	Double hull in 2011
MARINE CHEMIST	Chemical Tanker	1	36524	11/1/70		Y	Y	Double hull in 2000
SEA VENTURE	Chemical Tanker	1	18920	6/1/72	6/1/83	Y	N	Double hull in 2013
SEABULK AMERICA	Chemical Tanker	1	47053	6/1/75	6/1/90	Y	N	Double hull
VALIANT	Chemical Tanker	5	7634	6/1/73		N	N	
ARCO TEXAS	Crude Tanker (Any Size)	1	91389	6/1/73	6/1/81	Y	N	Phase out in 2004
CHESAPEAKE CITY	Crude Tanker (Any Size)	1	79998	11/1/81	11/1/86	N	N	
DILIGENCE	Crude Tanker (Any Size)	1	39886	7/1/77		Y	Y	Double hull
INTEGRITY	Crude Tanker (Any Size)	1	39847	12/1/75		Y	Y	Double hull
OCEAN CITY	Crude Tanker (Any Size)	1	79998	6/1/81		N	N	Double hull
S/R BAYTOWN	Crude Tanker (Any Size)	1	59233	8/1/84		Y	Y	
SEA ISLE CITY	Crude Tanker (Any Size)	1	81283	6/1/81		N	N	
BALTIMORE/BALTIMORE	Liquid - ITB	1	48768	5/1/83		Y	N	Double hull in 2013
CONSTITUTION/OCEAN 280	Liquid - ITB	1	37170	3/1/72		N	N	
ENERGY ALTAIR/ENERGY AMMON	Liquid - ITB	1	16000	6/1/82		Y	N	
GROTON/GROTON	Liquid - ITB	1	48768	6/1/82		Y	N	Double hull in 2012
JACKSONVILLE/JACKSONVILLE	Liquid - ITB	1	48768	1/1/82		Y	N	Double hull in 2012
MOBILE/MOBILE	Liquid - ITB	1	48000	6/1/83		Y	N	Double hull in 2013
NEW YORK/NEW YORK	Liquid - ITB	1	48000	6/1/83		Y	N	Double hull in 2012
PHILADELPHIA/PHILADELPHIA	Liquid - ITB	1	48000	6/1/83		Y	N	Double hull in 2013
SEABULK CHALLENGER/STL3901	Liquid - ITB	1	45720	1/1/75		Y	N	Double hull in 2013
SEABULK MAGNACHEM/SCC3902	Liquid - ITB	1	46086	2/1/77		Y	N	Double hull in 2007

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JA=Jones Act
VTA = Volunteer Tanker Agreement

APPENDIX J. (Cont) MILITARY USEFUL U.S. FLAGGED VESSELS

VESSEL	TYPE	IC	DWT	BUILT	REBUILT	J A	VTA	STATUS
SMT CHEMICAL TRADER/OXY4101	Liquid - ITB	1	37647	3/1/81	2/1/82	N	N	Double hull in 2010
ALLEGIANCE	Product Tanker	1	31382	12/1/80		Y	Y	Double hull in 2005
AMERICAN PROGRESS	Product Tanker	1	46000	6/1/97		Y	N	Double hull
ANASAZI	Product Tanker	1	38757	6/1/96		Y	Y	Double hull
ARCO PRUDHOE BAY	Product Tanker	1	70899	12/1/71		Y	Y	Phase out in 2001
ARCO SAG RIVER	Product Tanker	1	70899	5/1/72		Y	Y	Phase out in 2001
ARCO TRADER	Product Tanker	1	50918	6/1/82		Y	N	Phased out
BLUE RIDGE	Product Tanker	1	41600	6/1/81		Y	N	Double hull in 2011
CAPT. H.A. DOWNING	Product Tanker	1	38757	6/1/96		Y	Y	Double hull; trading grain
CHAMPION	Product Tanker	1	37853	4/12/69		Y	N	Double hull in 2000; trading grain
CHELSEA	Product Tanker	1	40368	2/1/75	4/1/83	Y	Y	Double hull in 2003
CHERRY VALLEY	Product Tanker	1	40302	7/1/74	8/1/83	Y	Y	Double hull in 2002
CHESAPEAKE TRADER	Product Tanker	1	50116	10/1/82		Y	N	Double hull in 2012
CHEVRON ARIZONA	Product Tanker	1	39207	12/1/77		Y	Y	Double hull
CHEVRON COLORADO	Product Tanker	1	39213	12/1/76		Y	Y	Double hull
CHEVRON MISSISSIPPI	Product Tanker	1	70213	10/1/72		Y	Y	Phased out in 1998
CHEVRON WASHINGTON	Product Tanker	1	39167	6/1/76		Y	Y	Double hull
COAST RANGE	Product Tanker	1	39990	6/1/81		Y	N	Double hull in 2011
COASTAL CORPUS CHRISTI	Product Tanker	1	51196	11/1/60		Y	N	Double hull in 2006; trading grain
COASTAL EAGLE POINT	Product Tanker	1	51051	7/1/60		Y	N	Dobule hull in 2006
COASTAL HOUSTON	Product Tanker	1	39973	12/1/73	9/1/83	N	Y	
COASTAL MANATEE	Product Tanker	1	31292	12/1/61		Y	N	Double hull; trading MTBE
COASTAL NEW YORK	Product Tanker	1	38121	7/1/56	6/1/71	Y	N	Double hull in 2001; trading grain
COLORADO	Product Tanker	1	31073	2/1/44	2/1/72	Y	Y	Double hull in 2004
CORONADO	Product Tanker	1	39767	1973		Y	N	Double hull in 2002

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APPENDIX J. (Cont) MILITARY USEFUL U.S. FLAGGED VESSELS

VESSEL	TYPE	IC	DWT	BUILT	REBUILT	J A	VTA	STATUS
COURIER	Product Tanker	1	35663	1/1/77		N	Y	Double hull in 2004
DELAWARE TRADER	Product Tanker	1	50000	1982		Y	N	Double hull in 2013
FREDERICKSBURG	Product Tanker	1	39889	6/1/58	6/1/80	Y	N	Double hull in 2005;lay-up;chemica
GOLDEN GATE	Product Tanker	1	63125	6/1/70		Y	N	Phase out in 2000; trading MTBE
GUADALUPE	Product Tanker	1	30369	6/1/45	6/1/78	Y	Y	Double hull in 2004
GUS W DARNELL	Product Tanker	5	27940	8/1/85		Y	N	Double hull
HMI AMBROSE CHANNEL	Product Tanker	1	45671	3/1/99		Y	N	Double hull
HMI BRENTON REEF	Product Tanker	1	45311	6/1/99		Y	N	Double hull
HMI CAPE LOOKOUT SHOALS	Product Tanker	1	46094	12/1/98		Y	N	Double hull
HMI DEFENDER	Product Tanker	1	38451	3/1/69		Y	Y	
HMI DIAMOND SHOALS	Product Tanker	1	46094	12/1/98		Y	N	Double hull; trading grain
HMI NANTUCKET SHOALS	Product Tanker	1	46069	6/1/98		Y	N	Double hull in 2011
HMI PETROCHEM	Product Tanker	1	51666	12/1/81		Y	Y	Double hull in 2000
HMI TRADER	Product Tanker	1	32732	6/1/45	6/1/71	Y	N	
KEYSTONE TEXAS	Product Tanker	1	42396	12/1/81		Y	N	Double hull in 2011
LAWRENCE H GIANELLA	Product Tanker	5	29500	4/1/86		Y	N	Double hull
LEADER	Product Tanker	1	37797	6/1/69		Y	Y	Trading grain
MARY BAY	Product Tanker	1	76843	6/1/70		Y	Y	Trading grain
MORMACSKY	Product Tanker	1	39851	2/1/77		N	Y	Double hull in 2004
MORMACSTAR	Product Tanker	1	39851	12/1/75		Y	Y	Double hull in 2003
MORMACSUN	Product Tanker	1	39851	6/1/76		Y	Y	Double hull in 2003
NEW RIVER	Product Tanker	1	38289	6/1/96		Y	Y	Double hull; chemical
OVERSEAS NEW ORLEANS	Product Tanker	1	38100	6/1/83		Y	N	Double hull in 2013; trading grain
OVERSEAS PHILADELPHIA	Product Tanker	1	38100	5/1/82		Y	N	Double hull in 2012; trading grain
OVERSEAS VIVIAN	Product Tanker	1	38421	1/1/69		Y	N	Double hull in 2000
PATRIOT	Product Tanker	1	35653	4/1/76	4/1/81	Y	Y	Double hull in 2003

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APPENDIX J. (Cont) MILITARY USEFUL U.S. FLAGGED VESSELS

VESSEL	TYPE	IC	DWT	BUILT	REBUILT	J A	VTA	STATUS
PAUL BUCK	Product Tanker	5	30127	6/1/85		Y	N	Double hull
PERSEVERANCE	Product Tanker	1	33991	7/1/81		Y	Y	Double hull; trading in Puerto Rico
POTOMAC TRADER	Product Tanker	1	50902	5/1/83		Y	N	Double hull in 2013
RICHARD G MATTHIESEN	Product Tanker	5	29500	2/1/86		Y	N	Double hull
ROVER	Product Tanker	1	35653	1/1/77		Y	Y	Double hull in 2004; trading grain
S/R BATON ROUGE	Product Tanker	1	76843	3/1/70		Y	Y	Trading grain
S/R CHARLESTON	Product Tanker	1	48890	10/1/83		Y	Y	Double hull
S/R GALVESTON	Product Tanker	1	27147	9/1/70	6/1/70	Y	Y	Double hull in 2005
S/R WILMINGTON	Product Tanker	1	48890	7/1/84		Y	Y	Double hull
SAMUEL L COBB	Product Tanker	5	27500	11/1/85		Y	N	Double hull
SANDY BAY	Product Tanker	1	76843	12/1/69		Y	Y	Trading grain
SEA PRINCESS	Product Tanker	1	37874	6/1/72		Y	N	Double hull in 2001; trading grain
STONE BUCCANEER	Product Tanker	1	3606	6/1/85		Y	N	
THE MONSEIGNEUR	Product Tanker	1	38289	6/1/97		Y	Y	Double hull; chemical
TRINITY	Product Tanker	1	38482	10/1/66		Y	Y	Double hull in 1999; trading grain
OVERSEAS BOSTON	Product Tanker	1	123626	1974		Y	N	Phase out in 2004; BP Charter
OVERSEAS JUNEAU	Product Tanker	1	122000	1973		N	N	Trading grain
OVERSEAS CHICAGO	Product Tanker (> 80,000 DWT)	1	92087	6/1/77		Y	N	Phase out in 2005; BP Charter
OVERSEAS NEW YORK	Product Tanker (> 80,000 DWT)	1	91839	12/1/77		Y	N	Phase out in 2005; BP Charter
OVERSEAS OHIO	Product Tanker (> 80,000 DWT)	1	92013	10/1/77		Y	N	Phase out in 2005; BP Charter
OVERSEAS WASHINGTON	Product Tanker (> 80,000 DWT)	1	91963	3/1/78		Y	N	Phase out in 2005; BP Charter

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APPENDIX K. VOLUNTARY TANKER AGREEMENT

VESSEL	FLG	TYPE	DWT	BUILT
CHEMICAL PIONEER	US	Chemical Tanker	34928	6/1/68
HMI DYNACHEM	US	Chemical Tanker	51666	9/1/81
MARINE CHEMIST	US	Chemical Tanker	36524	11/1/70
PAULINA	LI	Chemical Tanker	29992	9/1/84
PERNILLE	LI	Chemical Tanker	29974	5/1/84
ROYAL ARROW	RM	Chemical Tanker	39776	9/1/83
SYLVAN ARROW	RM	Chemical Tanker	39731	6/1/83
ACOAXET	BF	Crude Tanker (Any Size)	35607	8/1/82
AQUIDNECK	BF	Crude Tanker (Any Size)	35597	9/1/81
ARCO ALASKA	US	Crude Tanker (Any Size)	191451	12/1/79
ARCO CALIFORNIA	US	Crude Tanker (Any Size)	191716	7/1/80
ARCO INDEPENDENCE	US	Crude Tanker (Any Size)	262376	11/1/77
ARCO SPIRIT	US	Crude Tanker (Any Size)	262376	4/1/77
ARCO TEXAS	US	Crude Tanker (Any Size)	91389	6/1/73
ASTRAL	LI	Crude Tanker (Any Size)	127505	6/1/75
ATLANTIA	RM	Crude Tanker (Any Size)	97124	10/1/79
B T ALASKA	US	Crude Tanker (Any Size)	185119	3/1/78
CHARLES PIGOTT	LI	Crude Tanker (Any Size)	268373	12/1/73
CHEVRON COPENHAGEN	LI	Crude Tanker (Any Size)	268226	8/1/74
CHEVRON FELUY	LI	Crude Tanker (Any Size)	268418	11/1/73
CHEVRON NAGASAKI	LI	Crude Tanker (Any Size)	268230	4/1/74
CHEVRON ZENITH	LI	Crude Tanker (Any Size)	96716	4/1/72
DILIGENCE	US	Crude Tanker (Any Size)	39886	7/1/77
EAGLE	RM	Crude Tanker (Any Size)	284479	6/1/93
ECLIPSE	RM	Crude Tanker (Any Size)	135134	11/1/89
FAIRBANKS	US	Crude Tanker (Any Size)	122244	8/1/74
FALCON	RM	Crude Tanker (Any Size)	284089	6/1/76
HARRIER	RM	Crude Tanker (Any Size)	280487	6/1/75
HAWK	RM	Crude Tanker (Any Size)	284449	6/1/76
INTEGRITY	US	Crude Tanker (Any Size)	39847	12/1/75
JAMES N SULLIVAN	LI	Crude Tanker (Any Size)	134119	6/1/92
JOHN YOUNG	LI	Crude Tanker (Any Size)	170130	6/1/90
JUNEAU	US	Crude Tanker (Any Size)	122244	5/1/74
KENNETH E HILL	BF	Crude Tanker (Any Size)	81273	6/1/79
MAGNOLIA	RM	Crude Tanker (Any Size)	280314	6/1/73
MARINE COLUMBIA	US	Crude Tanker (Any Size)	138334	5/1/74
RAYMOND E. GALVIN	BF	Crude Tanker (Any Size)	35596	1/1/83
S/R BAYTOWN	US	Crude Tanker (Any Size)	59233	8/1/84
S/R BENICIA	US	Crude Tanker (Any Size)	175539	6/1/79
S/R LONG BEACH	US	Crude Tanker (Any Size)	211469	1/1/87
S/R MEDITERRANEAN	US	Crude Tanker (Any Size)	214861	12/1/86
S/R NORTH SLOPE	US	Crude Tanker (Any Size)	175298	2/1/79
SAUDI GLORY	LI	Crude Tanker (Any Size)	276368	3/1/74
SAUDI SPLENDOR	LI	Crude Tanker (Any Size)	281595	4/1/75
SOKOLICA	LI	Crude Tanker (Any Size)	145648	6/1/75
VENUS V	RM	Crude Tanker (Any Size)	79999	1/1/81
VESTA	PM	Crude Tanker (Any Size)	81278	12/1/80

APPENDIX K. (Cont) VOLUNTARY TANKER AGREEMENT

VESSEL	FLG	TYPE	DWT	BUILT
WANETA	RM	Crude Tanker (Any Size)	81282	6/1/82
WAPELLO	RM	Crude Tanker (Any Size)	81283	6/1/82
AMOCO ATLANTA/VIRGINIA BAY	US	Liquid - ITB	23000	6/1/82
AMOCO COLUMBIA/S CAROLINA	US	Liquid - ITB	23000	
APRIL/GEORGIA BAY	US	Liquid - ITB	19600	6/1/82
DECLARATION/CARIBE SUN	US	Liquid - ITB	10524	6/1/70
NEW JERSEY SUN/ISLAND SUN	US	Liquid - ITB	8540	6/1/75
REPUBLIC/SAN JUAN	US	Liquid - ITB	6490	6/1/70
TALLAHASSEE BAY/FLORIDA BA	US	Liquid - ITB	23000	6/1/81
YABUCOA SUN/BORINQUEN SUN	US	Liquid - ITB	7817	6/1/75
ACUSHNET	BF	Product Tanker	35586	11/1/81
ALLEGIANCE	US	Product Tanker	31382	12/1/80
ALMA	LI	Product Tanker	29999	6/1/88
ANASAZI	US	Product Tanker	38757	6/1/96
ARCO PRUDHOE BAY	US	Product Tanker	70899	12/1/71
ARCO SAG RIVER	US	Product Tanker	70899	5/1/72
CAPT. H.A. DOWNING	US	Product Tanker	38757	6/1/96
CARLA A HILLS	LI	Product Tanker	35596	8/1/81
CHARLES B RENFREW	BF	Product Tanker	78656	6/1/88
CHELSEA	US	Product Tanker	40368	2/1/75
CHERRY VALLEY	US	Product Tanker	40302	7/1/74
CHEVRON ARIZONA	US	Product Tanker	39207	12/1/77
CHEVRON COLORADO	US	Product Tanker	39213	12/1/76
CHEVRON MISSISSIPPI	US	Product Tanker	70213	10/1/72
CHEVRON WASHINGTON	US	Product Tanker	39167	6/1/76
COASTAL HOUSTON	US	Product Tanker	39973	12/1/73
COLORADO	US	Product Tanker	31073	2/1/44
COURIER	US	Product Tanker	35663	1/1/77
DELPHINA	RM	Product Tanker	39674	5/1/89
DIANE	RM	Product Tanker	64140	3/1/87
ELBE	LI	Product Tanker	66800	6/1/84
GUADALUPE	US	Product Tanker	30369	6/1/45
HMI DEFENDER	US	Product Tanker	38451	3/1/69
HMI PETROCHEM	US	Product Tanker	51666	12/1/81
HMI TRADER	US	Product Tanker	32732	6/1/45
KENNETH T DERR	BF	Product Tanker	36157	6/1/82
LEADER	US	Product Tanker	37797	6/1/69
LIMAR	LI	Product Tanker	29999	6/1/88
LUCY	RM	Product Tanker	64000	10/1/86
MARY ANN	RM	Product Tanker	64239	11/1/86
MARY BAY	US	Product Tanker	76843	6/1/70
MORMACSKY	US	Product Tanker	39851	2/1/77
MORMACSTAR	US	Product Tanker	39851	12/1/75
MORMACSUN	US	Product Tanker	39851	6/1/76
NEPTUNE	RM	Product Tanker	39800	6/1/89
NEW RIVER	US	Product Tanker	38289	6/1/96
NILE	LI	Product Tanker	66807	10/1/81
PAGODA	LI	Product Tanker	29996	6/1/88

APPENDIX K. (Cont) VOLUNTARY TANKER AGREEMENT

VESSEL	FLG	TYPE	DWT	BUILT
PATRIOT	US	Product Tanker	35653	4/1/76
PERSEVERANCE	US	Product Tanker	33991	7/1/81
R HAL DEAN	BF	Product Tanker	78656	6/1/88
ROVER	US	Product Tanker	35653	1/1/77
S/R BATON ROUGE	US	Product Tanker	76843	3/1/70
S/R CHARLESTON	US	Product Tanker	48890	10/1/83
S/R GALVESTON	US	Product Tanker	27147	9/1/70
S/R WILMINGTON	US	Product Tanker	48890	7/1/84
SACONA	RM	Product Tanker	33187	1/1/82
SAMOSET	RM	Product Tanker	33235	3/1/82
SANDY BAY	US	Product Tanker	76843	12/1/69
SAUCON	RM	Product Tanker	33157	4/1/83
SUZANNÈ	RM	Product Tanker	64000	9/1/86
THE MONSEIGNEUR	US	Product Tanker	38289	6/1/97
TRINITY	US	Product Tanker	38482	10/1/66
URANUS	RM	Product Tanker	39171	6/1/88
VEGA	RM	Product Tanker	39674	6/1/89
VOLGA	LI	Product Tanker	65686	6/1/81
WILLIAM E. CRAIN	LI	Product Tanker	155127	6/1/92
ALTA	LI	Product Tanker (over 80,000 DWT)	140219	6/1/90
ANIA	RM	Product Tanker (over 80,000 DWT)	94847	10/1/94
BERYL	RM	Product Tanker (over 80,000 DWT)	94799	6/1/94
BRUCE SMART	LI	Product Tanker (over 80,000 DWT)	155150	6/1/91
CAIRO SEA	LI	Product Tanker (over 80,000 DWT)	134999	6/1/75
CHEVRON ATLANTIC	BF	Product Tanker (over 80,000 DWT)	149748	6/1/92
CHEVRON EMPLOYEE PRIDE	BF	Product Tanker (over 80,000 DWT)	156447	6/1/94
CHEVRON MARINER	LI	Product Tanker (over 80,000 DWT)	156380	6/1/94
CHEVRON PERTH	BF	Product Tanker (over 80,000 DWT)	272394	6/1/75
COLORADO	LI	Product Tanker (over 80,000 DWT)	86648	6/1/80
CONDOLEEZZA RICE	BF	Product Tanker (over 80,000 DWT)	135829	6/1/93
CZANTORIA	LI	Product Tanker (over 80,000 DWT)	146110	6/1/75
ELIANE	RM	Product Tanker (over 80,000 DWT)	94813	6/1/94
GEORGE SHULTZ	LI	Product Tanker (over 80,000 DWT)	136055	6/1/93
J DENNIS BONNEY	LI	Product Tanker (over 80,000 DWT)	153010	6/1/91
PACIFIC RUBY	RM	Product Tanker (over 80,000 DWT)	84999	6/1/94
PACIFIC SAPPHIRE	RM	Product Tanker (over 80,000 DWT)	96173	6/1/94
REBECCA	RM	Product Tanker (over 80,000 DWT)	94872	6/1/94
SAMUEL GINN	BF	Product Tanker (over 80,000 DWT)	156835	6/1/93
TANANA	LI	Product Tanker (over 80,000 DWT)	141720	6/1/92
TRINIDAD SEA	LI	Product Tanker (over 80,000 DWT)	134999	6/1/74
WABASHA	LI	Product Tanker (over 80,000 DWT)	81278	6/1/75
WHITE SEA	LI	Product Tanker (over 80,000 DWT)	132500	6/1/75
WINAMAC	RM	Product Tanker (over 80,000 DWT)	80650	6/1/82

NON-US FLAG CODES: BF=BAHAMAS, LI=LIBERIA, PM=PANAMA, RM=REPUBLIC OF THE MARSHALL ISLANDS

Source: Maritime Administraion

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APPENDIX L. OIL POLLUTION ACT -1990
U.S . FLAG PRODUCT TANKERS (18,000 DWT - 55,000 DWT)

Vessel	GRT	DWT	Built	Rebuilt	Double Hull Due Year
Coastal Manatee	19.0	30.8	1961		1998 (trading MTBE)
Trinity	20.6	37.9	1966		1999 (trading grain)
Leader	20.9	37.8	1968		2000 (trading grain)
Willamette	20.9	37.8	1968		2000
Overseas Vivian	20.9	37.8	1969		2000
Champion	20.9	37.8	1969		2000 (trading grain)
Concho	18.7	32.7	1945	1970	2000
Marine Chemist	20.2	35.9	1970		2000
Coastal New York	23.5	39.4	1956	1972	2001
Sea Princess	20.8	37.3	1972		2001
Coronado	22.4	39.7	1973		2002
Cherry Valley	22.4	39.7	1974		2002
Chelsea	22.4	39.7	1975		2003
Seabulk Challenger	20.0	39.3	1975		2003
Mormacstar	22.3	39.3	1975		2003
Mormacsun	22.3	39.2	1976		2003
Patriot	21.6	35.1	1976		2003
Colorado	14.9	30.6	1944	1972	2004
Mormacsky	22.3	39.2	1977		2004
Rover	21.6	35.1	1977		2004
Courier	21.6	35.1	1977		2004
Guadalupe	18.0	30.4	1945	1978	2004
S.R. Galveston (crude)	12.8	27.3	1970	1978	2005
Fredericksburg	21.6	39.4	1958	1980	2005
Charleston	21.6	39.4	1956	1980	2005
Allegiance	18.5	34.4	1980		2005
Coastal Eagle Point	26.2	51.0	1960	1981	2006
Coastal Corpus Christi	23.3	51.2	1960	1981	2006
Perserverence	17.5	34.1	1981		2006
Chilbar	21.9	39.4	1959	1981	2006
Chemical Trader	17.1	45.3	1981		2010
Blue Ridge	21.4	42,3	1981		2011
Keystone Texas	21.4	40.0	1981		2011
Coast Range	21.4	40.0	1981		2011
HMI Petrochem	32.3	50.9	1981		2011
HMI Dynachem	32.3	50.9	1981		2011
Chemical Explorer	17.1	50.1	1981		2011
Chesapeake Trader	24.7	43.0	1982		2012

APPENDIX L. (Cont) OIL POLLUTION ACT -1990
U.S . FLAG PRODUCT TANKERS (18,000 DWT - 55,000 DWT)

Vessel	GRT	DWT	Built	Rebuilt	Double Hull Due Year
Overseas Philadelphia	21.5	48.0	1982		2012
Groton	22.4	48.0	1982		2012
New York	22.4	48.0	1982		2012
Jacksonville	22.4	48.0	1982		2012
Baltimore	22.4	48.0	1983		2013
Sea Venture	9.9	18.9	1971	1983	2013
Mobile	22.4	48.0	1983		2013
Philadelphia	22.4	48.0	1983		2013
Delaware Trader	24.7	50.1	1983		2013
Overseas New Orleans	21.5	43.0	1983		2013
Potomac Trader	24.7	50.1	1983		2013
S.R. Charleston	27.8	48.0	1983		2013
S.R. Wilmington	27.5	48.0	1984		2014
Seabilk America	22.1	46.5	1975	1990	2015
Chemical Pioneer	20.0	34.9	1968	1983	Double Hull
Integrity	16.9	39.2	1975		Double Hull
Chevron Colorado	16.9	39.2	1976		Double Hull
Chevron Washington	16.9	39.2	1976		Double Hull
Diligence	16.9	39.2	1977		Double Hull
Chevron Arizona	16.9	39.2	1977		Double Hull
Paul Buck	19.0	29.5	1985		Double Hull
Samuel L. Cobb	19.0	32.6	1985		Double Hull
Gus W. Darnell	19.0	30.1	1985		Double Hull
Richard G. Matthiesen	19.0	32.4	1986		Double Hull
Lawrence H. Gianella	19.3	32.4	1986		Double Hull
Capt H.A. Downing	20.1	34.7	1957	1996	Double Hull
Anasazi	20.0	34.7	1958	1997	Double Hull
New River	19.0	30.8	1959	1997	Double Hull
The Monseigneur	19.0	30.8	1960	1997	Double Hull
American Progress	30.3	45.3	1997		Double Hull
HMI Cape Lookout Shoals	30.3	45.3	1998		Double Hull
HMI Diamond Shoals	30.3	45.3	1998		Double Hull
HMI Nantucket Shoals	30.3	45.3	1998		Double Hull
HMI Ambrose Shoals	30.3	45.3	1999		Double Hull
HMI Brenton Reef	30.3	45.3	1999		Double Hull

Source: Military Sealift Command

APPENDIX M. OIL POLLUTION ACT - 1990 PHASE-OUT LIST
U.S. FLAG TANKERS 55,000 DWT AND LARGER

Vessel	GRT	DWT	Built	Phase Out
Sandy Bay	34.3	75.6	1969	1999 (Trading grain)
Mary Bay	38.1	76.2	1970	1997 (Trading grain)
S.R. Baton Rouge	34.3	75.6	1970	1997 (Trading grain)
Chevron Mississippi	35.6	70.2	1972	1998
Anchorage	52.5	120.3	1973	1998 Flagged foreign; layup
Overseas Juneau	57.7	120.5	1973	1998 (Trading grain)
Juneau	52.5	120.3	1974	1999 (Trading grain)
ARCO Fairbanks	28.2	62.0	1970	2000 BP Charter
Golden Gate	27.2	62.1	1970	2000 MTBE Trade only
ARCO Spirit	117.5	262.4	1977	2000
ARCO Independence	117.5	262.4	1977	2000
Atigun Pass	74.3	173.4	1977	2000 Lay-up due to fractures
ARCO Prudhoe Bay	35.6	70.4	1971	2001
ARCO Sag River	35.6	70.4	1972	2001
Keystone Canyon	74.3	124.9	1978	2001 Lay-up due to fractures
Thompson Pass	74.3	173.4	1978	2001 Lay-up due to fractures
Brooks Range	74.3	173.4	1978	2001 Lay-up due to fractures
S.R. Benicia	75.3	172.8	1979	2002
S.R. North Slope	75.3	173.4	1979	2002
ARCO Texas	35.9	90.0	1973	2004
Overseas Boston	60.8	121.7	1974	2004 BP Charter
Overseas New York	44.9	90.4	1977	2005 BP Charter
Overseas Chicago	44.9	90.6	1977	2005 BP Charter
Overseas Ohio	44.9	90.6	1977	2005 BP Charter
MTL Columbia	67.8	136.5	1974	2006 BP Charter
Overseas Washington	44.9	90.5	1978	2006 BP Charter
Denali	83.7	188.1	1978	2006 BP Charter
B.T. Alaska	83.6	188.1	1978	2006 BP Charter
ARCO Alaska	83.6	188.4	1979	2007
ARCO California	83.7	188.4	1980	2008
S.R. Mediterranean	95.2	211.5	1986	2009
S.R. Long Beach	95.0	211.5	1987	2010
PR. William Sound	60.1	124.0	1975	Double Hull
Tonsina	60.4	122.8	1978	Double Hull - BP Charter
Kenai	60.4	125.1	1979	Double Hull - BP Charter
ARCO Endeavor		125.0	2001	Double Hull
ARCO Discovery		125.0	2002	Double Hull
ARCO Resolution		125.0	2002	DH

Source: Military Sealift Command

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APPENDIX N. MAJOR MERCHANT TANKER FLEETS OF THE WORLD - 1999

Country	No. of ships	GRT (000)	DWT (000)
All Countires	6,781	182,147	317,337
United States	154	5,189	9,289
Panama	985	27,396	47,516
Liberia	698	38,820	57,659
Greece	262	13,398	25,516
Bahamas	249	12,952	23,670
Malta	352	10,294	18,758
Cyprus	179	4,308	7,386
Singapore	384	9,502	16,690
Norway (Norwegian Int Ship)	289	11,134	19,642
China (Peopls's Republic of)	248	2,071	3,251
Japan	279	7,109	10,507
Phillipines	68	182	280
Saint Vincent & the Grenadines	96	1,152	1,968
Marshall Islands	43	3,785	7,045
India	97	2,936	5,110
Hong Kong, China	9	346	642
Turkey	73	583	1,039
Germany	19	178	272
Taiwan	17	901	1,554
Russia	266	1,549	2,235
Korea (South)	106	483	829
Bermuda	33	2,726	4,758
Italy	193	2,242	3,515
Malaysia	112	2,187	3,024
Brazil	76	1,877	3,171
Isle Of Man	72	2,496	4,409
Denmark (Danish Int Ship)	66	1,289	2,182
Iran	24	1,624	3,141
French Antartic Territory	35	1,621	3,088
Kuwait	28	1,939	3,341
Netherlands	59	441	685
Indonesia	123	817	1,297
Antigua & Barbuda	10	28	42
Thailand	89	367	661
Norway	39	1,553	2,749
Romania	8	197	337
Belize	64	350	623
United Kingdom	55	621	1,051
Australia	15	710	740
Egypt	16	212	368
France	25	881	1,570
Vanatu	9	112	160
Sweden	64	534	873
Cayman Islands	18	215	356
Bulgaria	11	151	267
Ukraine	22	63	95
Saudi Arabia	24	344	593
Portugal	30	422	703
Mexico	38	656	1,004

Source: 1999 World Almanac

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APPENDIX O. EFFECTIVE UNITED STATES CONTROL (EUSC) VESSELS

VESSEL	FLAG	VESSEL TYPE	DWT	BUILT
FAIRCHEM YONE	PM	Chemical Tanker	11668	6/1/95
GOLDEN DIANE	PM	Chemical Tanker	8400	6/1/97
GOLDEN KAY	PM	Chemical Tanker	8758	6/1/96
PAULINA	LI	Chemical Tanker	29992	9/1/84
PERNILLE	LI	Chemical Tanker	29974	5/1/84
ROYAL ARROW	RM	Chemical Tanker	39776	9/1/83
SYLVAN ARROW	RM	Chemical Tanker	39731	6/1/83
ACOAXET	BF	Crude Tanker (Any Size)	35607	8/1/82
AQUIDNECK	BF	Crude Tanker (Any Size)	35597	9/1/81
ATLANTIA	RM	Crude Tanker (Any Size)	97124	10/1/79
BAYWAY	LI	Crude Tanker (Any Size)	50915	6/1/78
CHEVRON ZENITH	LI	Crude Tanker (Any Size)	96716	4/1/72
CONTINENTAL	LI	Crude Tanker (Any Size)	98231	5/1/93
KENNETH E HILL	BF	Crude Tanker (Any Size)	81273	6/1/79
PALM BEACH	LI	Crude Tanker (Any Size)	50801	8/1/78
PIONEER	LI	Crude Tanker (Any Size)	96724	4/1/93
RAYMOND E. GALVIN	BF	Crude Tanker (Any Size)	35596	1/1/83
VENUS V	RM	Crude Tanker (Any Size)	79999	1/1/81
VESTA	PM	Crude Tanker (Any Size)	81278	12/1/80
WANETA	RM	Crude Tanker (Any Size)	81282	6/1/82
WAPELLO	RM	Crude Tanker (Any Size)	81283	6/1/82
WENATCHI	RM	Crude Tanker (Any Size)	91680	6/1/98
MARLIN	LI	Ore/Bulk/Oil	15000	1/1/77
TARPON	LI	Ore/Bulk/Oil	15000	4/1/77
ACUSHNET	BF	Product Tanker	35586	11/1/81
ALMA	LI	Product Tanker	29999	6/1/88
CARLA A HILLS	LI	Product Tanker	35596	8/1/81
CHARLES B RENFREW	BF	Product Tanker	78656	6/1/88
CHILIBRE	PM	Product Tanker	3678	3/1/70
DANUBE	LI	Product Tanker	29900	6/1/90
DELPHINA	RM	Product Tanker	39674	5/1/89
DIANE	RM	Product Tanker	64140	3/1/87
ELBE	LI	Product Tanker	66800	6/1/84
KENNETH T DERR	BF	Product Tanker	36157	6/1/82
LIMAR	LI	Product Tanker	29999	6/1/88
LUCY	RM	Product Tanker	64000	10/1/86
MARY ANN	RM	Product Tanker	64239	11/1/86
NEPTUNE	RM	Product Tanker	39800	6/1/89
NILE	LI	Product Tanker	66807	10/1/81
PAGODA	LI	Product Tanker	29996	6/1/88
PATTY ANN	PM	Product Tanker	27380	8/1/74
R HAL DEAN	BF	Product Tanker	78656	6/1/88
RACHEL B	LI	Product Tanker	13749	6/1/87
RIO GRANDE	LI	Product Tanker	15450	6/1/82
RIO NEGRO	LI	Product Tanker	38711	6/1/75

APPENDIX O. (CONT) EFFECTIVE UNITED STATES CONTROL (EUSC) VESSELS

VESSEL	FLAG	VESSEL TYPE	DWT	BUILT
SACONA	RM	Product Tanker	33187	1/1/82
SAMOSET	RM	Product Tanker	33235	3/1/82
SAN LORENZO	LI	Product Tanker	4720	6/1/70
SAUCON	RM	Product Tanker	33157	4/1/83
SEVERN	LI	Product Tanker	29998	6/1/88
SHANNON	LI	Product Tanker	29999	6/1/91
STAR BERGEN	BF	Product Tanker	31502	6/1/77
SUZANNE	RM	Product Tanker	64000	9/1/86
TIBER	LI	Product Tanker	29997	8/1/89
TRENT	LI	Product Tanker	29998	6/1/91
URANUS	RM	Product Tanker	39171	6/1/88
VEGA	RM	Product Tanker	39674	6/1/89
VOLGA	LI	Product Tanker	65686	6/1/81
ANIA	RM	Product Tanker (over 80,000 DWT)	94847	10/1/94
BERYL	RM	Product Tanker (over 80,000 DWT)	94799	6/1/94
COLORADO	LI	Product Tanker (over 80,000 DWT)	86648	6/1/80
CONSTITUTION	LI	Product Tanker (over 80,000 DWT)	81131	6/1/78
ELIANE	RM	Product Tanker (over 80,000 DWT)	94813	6/1/94
GUARDIAN	LI	Product Tanker (over 80,000 DWT)	96920	6/1/92
MARTHA A	LI	Product Tanker (over 80,000 DWT)	13500	6/1/86
PACIFIC RUBY	RM	Product Tanker (over 80,000 DWT)	84999	6/1/94
PACIFIC SAPPHIRE	RM	Product Tanker (over 80,000 DWT)	96173	6/1/94
PATRIOT	LI	Product Tanker (over 80,000 DWT)	96920	6/1/92
REBECCA	RM	Product Tanker (over 80,000 DWT)	94872	6/1/94
WABASHA	LI	Product Tanker (over 80,000 DWT)	81278	6/1/75
WINAMAC	RM	Product Tanker (over 80,000 DWT)	80650	6/1/82

* FLAG CODES ARE AS FOLLOWS: BF=BAHAMAS, LI=LIBERIA, PM=PANAMA, RM=REPUBLIC OF THE MARSHALL ISLANDS

Source: Maritime Administration

APPENDIX P. NATO TANKERS

Vessel	Built	GRT	DWT
Lima Chemist	1992	2634	3691
Tejo Chemist	1992	2634	3691
Valbrenta	1980	5507	8979
Bow Saphir	1982	12198	14960
Chryssi V	1961	12895	19635
Conger	1991	14332	24349
Dorsch	1991	14332	23031
Fair Delta	1959	12912	20622
Galp Leixoes	1983	12630	18436
NCC Asir	1982	14627	22653
Bow Fortune	1975	17561	27513
Bow Sea	1978	17561	27641
Bow Sky	1977	17561	27642
Bow Spring	1976	17561	27642
Bow Star	1976	17561	27642
Gerd	1975	17598	31004
Kriti Episkopi	1968	14547	24507
Kriti Gerani	1968	13642	24507
Kriti Gold	1972	17505	29494
Maddalena D'amato	1973	17888	30561
Bow Fighter	1982	20478	34376
Bow Lady	1978	18438	31716
Clipperventure	1981	18812	31244
Conquestventure	1980	18812	31264
Courageventure L	1980	18812	31228
Crystalventure	1980	18812	31176
Kriti Akti	1986	24233	40815
Kriti Art	1986	24233	40828
Kriti Champion	1987	26874	44593
Kriti Color	1987	26874	44590
Kriti Filoxenia	1986	26874	44529
Kriti Palm	1986	26874	44471
Kriti River	1986	24233	40828
Kriti Rubi	1973	17822	32075
Lady Ema	1973	18189	31857
Leopard	1985	26113	45372
Lion	1985	26113	45372
Panther	1985	26113	45372
Petrobulk Cougar	1988	26113	45372
Petrobulk Jaguar	1988	26113	45372
Santa Anna	1988	22637	39621

APPENDIX P. (Cont.) NATO TANKERS

Vessel	Built	GRT	DWT
Santa Maria	1986	22714	39458
Seaford	1977	18326	31101
Tiger	1985	26113	45372
World Process	1984	17199	29516
World Prodigy	1986	17277	29514
World Produce	1984	17277	29516
World Prologue	1985	17277	29516
World Prophet	1985	17277	29514
Alkyonis	1992	39265	65839
Alpha Intelligence	1982	29149	47807
Andromeda	1984	38267	62943
Argironissos	1992	29506	44708
Condor	1980	26974	53178
Folegandros	1992	29506	44708
Halki	1989	27793	45803
Kandilousa	1995	28507	45236
Kastelorizo	1991	29506	44708
Olga Maersk	1987	27997	49801
Parapola	1994	38792	67155
Psara	1989	27793	45803
Salamina	1991	29506	44708
Samothraki	1989	27793	45803
Serifopoulo	1995	28507	45962
Serifos	1995	28507	45236
Shinoussa	1990	27793	45803
Sporades	1993	39265	65839
St Michaelis	1981	21305	44854
St Nikolai	1982	25117	44854
United Sunrise	1982	29874	54489
United Triton	1981	29874	54531
Velopoula	1993	39265	65839

Source: Military Sealift Command

APPENDIX Q. KOREA TANKERS

Vessel	Built	GRT	DWT
Bum IK	1983	4585	7190
Diamond	1982	1643	3662
Fortune Irene	1983	3993	6604
Kwang Yang Pioneer	1991	1876	3704
Mee Yang	1993	1590	3446
Woo Gum	1992	1590	3498
Woo Seok	1996	1989	3861
Bum Dong	1980	9559	17128
Bum Ju	1983	9681	16976
Bum Ken	1980	13159	21962
Fortune Hera	1984	4565	7434
Pancon Ace	1985	4169	6859

Source: Military Sealift Command

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APPENDIX R. MSC VOYAGE CHARTERS 1997-1999

Country	Number	Dollar Amount	Cargo Quantity
Bahamas	10	$3,023,502.00	1,640,000 BBLS/49,766 LT
Bermuda	1	553,999.00	230,000 BBLS
Cyprus	14	4,990,410.00	2,117,806 BBLS/43,921 LT
Danish	1	520,000.00	235,000 BBLS
Denmark	1	312,991.00	135,000 BBLS
DIS	2	588,602.00	229,047 BBLS
DUTCH	1	189,715.00	10,715 BBLS
France	1	345,000.00	200,000 BBLS
Greece	2	855,400.00	620,000 BBLS
Hong Kong	1	239,399.00	115,000 BBLS
India	1	150,000.00	260,000 BBLS
Indian	1	225,000.00	31,578 LT
Isle of Man	1	188,500.00	120,000 BBLS
Italy	2	248,500.00	30,371 LT
Korean	2	188,000.00	70,000 BBLS
Liberia	14	5,036,485.00	2,301,802 BBLS/30,052 MT/30,128LT
Malaysia	1	220,500.00	250,000 BBLS
Malta	7	1,960,000.00	1,550,000 BBLS
NIS	1	375,000.00	235,000 BBLS
Norway	1	530,280.00	72,946 LT
Panama	6	1,899,532.00	1,068,000 BBLS
SING	2	706,000.00	485,000 BBLS
Singapore	3	1,650,511.00	615,000 BBLS/21,974 LT
United Arab Emirates	3	498,750.00	470,000 BBLS/36,975 LT
Total	79	$25,496,077.00	12,952,370 BBLS 30,052 MT 247,660 LT

Source: Military Sealift Command

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APPENDIX S. VOYAGE CHARTERS DURING FY99

Voyage Charters for FY99

Kosovo	Other	Total
19	31	50

Voyage Charters for Kosovo (Product)

Product	Amount	Total #
JP5/DFM	450,000 BBLs	2
DFM	796,000 BBLs	3
JP5	425,000 BBLs	2
JP8	2,496,000 BBLs	12
Total	4,167,000 BBLs	19

Voyage Charters for Kosovo (Vessel Flag)

Flag	Total #
United States	2
Bahamas	2
Cyprus	4
Malta	4
Panama	1
Isle of Man	1
Liberian	1
Singapaore	1
French	1
Danish	1
Norway	1
Total	19

Source: Defense Energy Support Center

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